

## A taxonomic revision of certain *Aedes* species (Diptera: Culicidae) of the subgenus *Aedimorphus* in southern Africa

by

B. M. McINTOSH

Arbovirus Research Unit,  
South African Institute for Medical Research, Johannesburg

A taxonomic revision is made of 22 species of mosquitoes of the genus *Aedes* Meigen, subgenus *Aedimorphus* Theobald, occurring in southern Africa. The adults and larvae of 19 species, namely, *mixtus*, *microstictus*, *argenteopunctatus*, *bedfordi*, *minutus*, *filicis*, *tarsalis*, *albocephalus*, *leesoni*, *alboventralis*, *eritreae*, *dalzieli*, *dentatus*, *subdentatus*, *pachyurus*, *bevisi*, *cumminsii*, *quasiunivittatus* and *orcharaceus*, in which existing descriptions are largely inadequate, are redescribed. Two new species, *veeniae* and *aerarius* are described. *Aedes eritreae karoensis* is raised to specific status. The 22 species studied are placed in 7 species groups on adult and larval characters. *Aedes tarsalis* is tentatively recorded from southern Africa for the first time. A key is provided for distinguishing the adult females of all 31 *Aedimorphus* species now known from southern Africa. Keys dealing with males and larvae of some of the species studied are also provided. Information on the biology and disease relationships of the species studied is given.

This paper deals with the taxonomy of 22 *Aedimorphus* species occurring in southern Africa and in which the tarsi lack distinctive pale markings. These species formed a dominant part of the aedine fauna collected during arbovirus field studies in South Africa and it was the experience that much of the adult female material collected could not be identified beyond the subgeneric level.

The existing definitive taxonomic studies on *Aedimorphus* in Africa are those by Edwards (1941) on the adults and pupae and by Hopkins (1952) on the larvae. In South Africa Muspratt issued several papers during the 1950's dealing with the taxonomy and biology of *Culicini* and some of this work was summarized when he published in 1955 a check-list of *Culicini* in South Africa which included notes on their distribution, taxonomy and biology. Hamon *et al.* (1961) dealt with the taxonomy of 14 *Aedimorphus* species of the *tarsalis* group in West Africa. Reinart (1973) revised the taxonomy of *Aedimorphus* in Southeast Asia and because of its comprehensiveness much of this study is relevant to African species.

The material on which the present study is based is that of the collections at the South African Institute for Medical Research (SAIMR), the British Museum (Natural History) (BM), and the Office de la Recherche Scientifique et Technique Outre-Mer, Bondy, France (ORSTOM). Much of the SAIMR material has been recently collected by myself and some is the result of rearings made from individual females in isolation. Unless otherwise stated, the holotypes of all the species were examined.

The species have been placed in 7 groups of what I believe are closely related species but this grouping should be regarded as tentative pending revision of the whole subgenus in Africa. From each group an adult female of a selected species is described first and in some detail. The species group carries the name of this species which was selected mainly because of the large amount of material available. The male of this species and remaining members of the group are then described comparatively to the female of the first species. Larval characters are only superficially described and the pupal omitted. However, in most species both these stages were studied in so far as was considered necessary to confirm the decisions arrived at from the study of adults.

Although closely following Edwards' groups (1941), the present grouping is based on a greater combination of characters including larval and tends, therefore, to include in each group fewer species of closer relationship. The groups, with their relationship to Edwards' groups indicated in parenthesis, and the characters defining them, are as follows:

1. *Mixtus* group (*argenteopunctatus*): *mixtus*; *microstictus*; *argenteopunctatus*; *bedfordi*; *minutus*.

Some of the decumbent vertical scales broad; prescutal and posterior fossal maculae consisting of broad, silver scales (narrow, yellow in *minutus*); scutellar scales silver, broad; postspiracular scales absent or poorly developed; tergal basal bands absent or reduced; hind posttarsal claws simple; basal mesal lobe poorly developed; gonostylus with quadrate apical expansion; larva with dorsally curved siphon; seta 1-S well developed, placed about level with distal pecten spine; comb with spines.

2. *Filicis* group (*tarsalis*): *filicis*; *veeniae*; *tarsalis*.

Similar to *mixtus* group except: decumbent vertical scales narrow; scutal maculae with narrow scales, white or yellow; scutellar scales broad or narrow sometimes yellow; tibiae III with conspicuous white apical spot; larval pecten with distal spines placed subapically and extending well beyond seta 1-S; comb with scales.

3. *Albocephalus* group (*tarsalis*): *albocephalus*.

Similar to *filicis* group except: scutellar scales yellow, some narrow; postspiracular scales and tergal bands well developed; base of costa with pale line; basal mesal lobe well developed; gonostylus forked; pecten on basal 0.5 of siphon; seta 1-S distal to pecten; comb with spines.

4. *Leesoni* group (*abnormalis*): *leesoni*; *alboventralis*; *critreae*; *karooensis*; *dalzieli*.

Scutum not markedly ornate; scutellar scales yellow, sometimes partially broad; postspiracular and subspiracular scales well developed; legs without conspicuous ornamentation; hind posttarsal claws simple; basal mesal lobe poorly differentiated; gonostylus expanded apically into intricate shape, bearing a row of setae along apical margin; seta 1-S small, distal to pecten; comb with scales.

5. *Dentatus* group (*dentatus*): *dentatus*; *subdentatus*; *pachyurus*; *bevizi*; *cumminsii*.

Similar to *leesoni* group except: scutellar scales always narrow; hind posttarsal claws armed; basal mesal lobe well developed; gonostylus expanding gradually towards apex and therefore without a contrastingly narrow arm; a single strong gonostylar claw present; comb with spines.

6. *Aerarius* group (*dentatus*): *aerarius*; *quasiunivittatus*.

Like *dentatus* group except: scutum rather ornate; femur II with median pale line; hind posttarsal claws simple; basal mesal lobe large, rectangular and 0.75 as long as gonocoxite; gonostylus forked.

7. *Ochraceus* group (*ochraceus*): *ochraceus*.

Scutum, legs, abdomen and wing rather ornate; hind posttarsal claws showing sexual dimorphism; larval siphon exceptionally long.

Two new species are described: *veeniae* which is probably closest to *yangambiensis* de Meillon & Lavoipierre, 1944, and *aerarius* which is closest to *gibbinsi* Edwards, 1935. The only formal taxonomic change is that *eritrear karoensis* has been raised to specific status.

I found the number of certain setae on the male palpus to be a valuable specific character. The setae concerned are those that occur as a clump ventrally on about the apical 0.1 of the shaft and as two rows on segment 4; on the latter, the total of both rows being cited. To increase the value of this character the setal alveoli were counted under a magnification of 400 on cleared palpi mounted on slides. Usually both palpi were mounted still joined to the proboscis and this also enabled more accurate measurement of the relative lengths of proboscis and palpus to be made. The range of variation of these palpal setae was not firmly established but it would seem that it is in the region of 10–20%. Unfortunately with heavily setose palpi accurate counts of setae on segment 4 are difficult to obtain.

To facilitate descriptions two pale spots on the scutum, best exemplified in some species of the *mixtus* group, are named. Both lie in the same longitudinal plane laterally of the dorsocentral line; the *prescutal macula* lies contiguous to the prescutal margin anterior to the scutal fossa and the *posterior fossal macula* lies just posterior to the fossa and is sometimes joined to a pale posterior fossal line or the outer posterior dorsocentral line (Knight and Lalloon, 1970).

The descriptions and keys, unless otherwise stated, refer only to species as I have found them to occur in southern Africa and may, therefore, not be applicable to the same species in other parts of Africa.

The number of upper mesepimeral setae were determined by counting the setal alveoli in cleared pleurae mounted on slides and examined under high magnification.

In addition to the well-known siphon index (SI) 3 other siphon indices described by Schick (1970) are usually cited. These are; the length of siphon relative to the saddle length (SL), the length of the pecten row relative to the siphon length (PL), and the position of the point of insertion of seta 1–S relative to the siphon length (HL).

### Key to *Aedimorphus* Species in Southern Africa

(Because in existing keys of aedine subgenera *Aedes* (*Ochlerotatus*) *fryeri* (Theobald) keys out with *Aedimorphus* species, *fryeri* is included in the following keys of adult *Aedimorphus*)

#### FEMALES

1 At least some tarsomeres with distinct pale bands .....	2
— Tarsomeres without distinct pale bands .....	11
2 Tarsus III with broad white bands evenly overlapping joints between tarsomeres 1–4 .....	<b>lamborni</b>
— Tarsus III otherwise .....	3
3 Tarsus III with broad apical bands on tarsomeres 1–3 .....	4
— Tarsus III without broad apical bands .....	7

- 4 All femora with pre-apical white spot ..... **marshallii** 5  
 — Femora without this spot ..... **kennethi** 6  
 5 Scutum with white scales varying from an almost complete covering to a broad area along lateral margin; tarsomere III<sub>4</sub> usually all white ..... **capensis** 6  
 — Pale areas of scutum as narrow stripes or spots; tarsomere III<sub>4</sub> with basal 0.5 or more dark ..... **haworthi** 8  
 6 Posterior fossal macula and lateral posterior dorsocentral line of scutum with broad silvery scales; tarsomeres I<sub>2</sub>, II<sub>2</sub> with apex dark ..... **vexans** 8  
 — Scutum without this spot or stripe; these tarsomeres with white apical mark ..... **durbanensis** 9  
 7 Wingfield dark ..... **hirsutus** 10  
 — Wingfield with at least some pale scales ..... **fowleri** 10  
 8 Terga II–VI with buff apicolateral patches; wing extensively speckled ..... **fryeri** 12  
 — Terga without these patches ..... **ochraceus** 12  
 9 Wingfield with apical 0.5 dark; sometimes apical 0.5 of costal fringe whitish ..... **filicis** 13  
 — Wingfield with white scales on apical 0.5; costal fringe dark ..... **tarsalis** 14  
 10 Base of upper fork wing cell proximal to that of lower fork; R<sub>2+3</sub>: R<sub>2</sub> vein ratio 0.47–0.55; tergum VII with submedian apical white patches ..... **minutus** 15  
 — Base of upper fork distal to that of lower fork; R<sub>2+3</sub>: R<sub>2</sub> ratio 0.87–1.04; tergum VII with narrow transverse apical white line ..... **argenteopunctatus** 17  
 11 Large pale yellow species; scutum with longitudinal stripes of yellow and brown scales; femora and tibiae with longitudinal yellow stripe bordered by dark stripes; costa yellow ..... **bedfordi** 18  
 — Not so ..... **mixtus** 19  
 12 Scutellar scales entirely broad, usually silvery white ..... **microstictus** 20  
 — Scutellum with narrow scales on at least median lobe, usually yellow ..... **quasiunivittatus** 21  
 13 Decumbent scales of vertex largely narrow ..... **aerarius** 22  
 — These scales largely broad ..... **bevisi** 23  
 14 Pale scales of scutum silvery white ..... **veeniae** 24  
 — These scales yellow ..... **subdentatus** 26  
 15 Prescutal and posterior fossal maculae with broad silvery white scales ..... **subdentatus** 26  
 — These spots with narrow yellow scales ..... **subdentatus** 26  
 16 Femora II, III with pre-apical white spot ..... **subdentatus** 26  
 — These spots absent ..... **subdentatus** 26  
 17 Patch of broad silvery white scales on scutal angle; a small subspiracular scale patch present ..... **subdentatus** 26  
 — Scutal angle without this patch; subspiracular scales absent ..... **subdentatus** 26  
 18 Wing length about 3.7 mm; 15–19 upper mesepimeral setae present ..... **subdentatus** 26  
 — Wing 2.9–3.3 mm; 9–11 of these setae present ..... **subdentatus** 26  
 19 Femur II with longitudinal median pale line anteriorly (sometimes reduced to scattered scales) ..... **subdentatus** 26  
 — Femur II without these pale scales ..... **subdentatus** 26  
 20 Femur III with white scales on apical 0.5 of anterior surface as narrow median line ..... **subdentatus** 26  
 — Femur III without such a narrow line ..... **subdentatus** 26  
 21 Tibia III with conspicuous apical white mark ..... **subdentatus** 26  
 — This spot yellow, sometimes small ..... **subdentatus** 26  
 22 Scutal scales largely pale; postspiracular scales usually present, sometimes numerous; costa with basal sixth pale ..... **subdentatus** 26  
 — Scutal scales largely dark; postspiraculars usually absent, when present very few; costa usually all dark but sometimes with small pale spot at base ..... **subdentatus** 26  
 23 Claws of posttarsus III armed ..... **subdentatus** 26  
 — These claws simple ..... **subdentatus** 26  
 24 Proboscis pale below and at sides on middle 0.6; tarsomeres 2, 3 with indistinct pale basal marks ..... **subdentatus** 26  
 — Proboscis dark (rarely slightly pale below); tarsomeres 2, 3 dark basally, at least anteriorly ..... **subdentatus** 26  
 25 Wing length about 5.0 mm; terga with basal median pale marks longer than broad ..... **subdentatus** 26  
 — Wing less than 4.5 mm; tergal bands broader than long ..... **subdentatus** 26  
 26 Palpus sometimes with scanty pale scaling at apex and/or below; sterna without median dark scaling; tarsomeres 2, 3 sometimes with yellow scaling basally posteriorly ..... **subdentatus** 26

- Palpus dark; sterna with dark scaling mesally ..... 27
- 27 Scutal scales largely dark, usually without distinct pattern ..... **dentatus**
- Scutal scales largely pale, with pale scales forming indefinite pattern of longitudinal lines and a pale border ..... **pachyurus**
- 28 Scutellum with some broad scales ..... **leesoni, alboventralis**
- These scales entirely narrow ..... 29
- 29 Erect scales of vertex pale; scutal scales almost entirely pale, lacking definite pattern ..... **karooensis**
- Erect scales of vertex dark; scutum with pattern of dark and pale scales ..... 30
- 30 Scutum with more pale than dark scales; postpronotal scales entirely pale, yellow or golden ..... **eritreae**
- Scutum with more dark than pale scales; postpronotal scales with yellow and dark brown scales; (Rhodesia only) ..... **dalzieli**

## MALES

(including only those species not reliably identifiable with  
the key for females)

- 1 Prescutal and posterior fossal maculae with broad silver scales ..... 2
- These maculae, if present, with narrow, yellow or white scales ..... 3
- 2 Palpus strongly setose; gonostylus with narrow arm ..... **mixtus**
- Palpus lightly setose; gonostylus with massive arm ..... **microstictus**
- 3 Tibia III with conspicuous white apical spot ..... 4
- Tibia III with inconspicuous yellow spot ..... 8
- 4 Stripe of pale scales on basal sixth of costa; gonostylus forked on apical 0.5 ..... **albocephalus**
- Costa at most with small pale spot ..... 5
- 5 Palpus very lightly setose; prescutal and posterior fossal maculae with white scales ..... **filicis**
- Palpus moderately setose; these maculae with yellow scales ..... 6
- 6 Scutellar scales yellow or creamy white ..... **veeniae**
- Scutellar scales silvery white ..... 7
- 7 Gonostylus with curved dorsal horn; gonocoxite lacking apical tuft of setae ..... **tarsalis**
- Gonostylus without curved dorsal horn; gonocoxite with apical tuft of setae ..... **minutus**
- 8 Claws of posttarsus III armed ..... 9
- These claws simple ..... 13
- 9 Large mosquito; terga with basal median pale marks longer than broad ..... **cumminsii**
- Medium-sized mosquito; tergal bands broader than long ..... 10
- 10 Gonostylar claw placed on finger-like projection ..... 11
- Gonostylar claw not on projection ..... 12
- 11 Palpus lightly setose ..... **pachyurus**
- Palpus strongly setose ..... **dentatus**
- 12 Palpus barely longer than proboscis; palpus moderately setose, apex of shaft with 33 setae, segment 4 with 76 ..... **subdentatus**
- Palpus longer than proboscis by about 0.5 of terminal segment; palpus strongly setose, shaft with 104 setae, segment 4 with 288 ..... **bevisi**
- 13 Basal mesal lobe strongly developed; gonostylus without a row of setae along apical margin ..... 14
- This lobe poorly differentiated; gonostylus with a row of setae on apical margin ..... 15
- 14 Palpus lightly setose; scutum rather ornate ..... **aerarius**
- Palpus strongly setose; scutum not strikingly ornate ..... **quasiunivittatus**
- 15 Gonostylus with horn on dorsal margin of arm ..... **leesoni**
- Gonostylar arm without horn ..... 16
- 16 Gonostylus with large pubescent projection apically ..... **alboventralis**
- Gonostylus without large projection ..... 17
- 17 Gonostylus with dorsal arm of terminal expansion narrow and strongly divergent from longitudinal axis of gonostylus ..... **dalzieli**
- Gonostylus with terminal expansion lacking this sort of arm ..... 18
- 18 Palpus longer than proboscis by length of terminal segment; palpus strongly setose ..... **eritreae**
- Palpus longer than proboscis by 0.5 or less of terminal segment; palpus moderately setose ..... **karooensis**

## LARVAE

1 Siphon index of 6.0-7.0 .....	<b>ochraceus</b>	
— Siphon index of 4.0 or less .....		2
2 Head capsule spiculate; chitinous plaques on skin of thorax and abdomen .....	<b>cumminsii</b>	
— Not so .....		3
3 Siphon curved dorsally .....	<b>mixtus</b> group	
— Siphon of normal shape .....		4
4 Comb consisting of scales .....		5
— Comb consisting of spines .....		6
5 Pecten with distal spines placed distal to seta 1-S; seta -S; of moderate size, about 0.5 siphon width .....	<b>filicis</b> group	
— Pecten with distal spines proximal to seta 1-S; seta 1-S minute .....	<b>teesoni</b> group	
6 Setae 5, 6-C single or with few branches, both setae together with less than 7 .....	<b>dentatus</b> group	
— Setae 5, 6-C with more branches, both setae with at least 9 .....		7
7 Pecten with 7-9 palish spines; dorsal anal papilla not more than 1.5 length of saddle .....	<b>albocephalus</b>	
— Pecten with 12-14 darkly pigmented spines, anal papilla about 2.5 length of saddle .....	<b>aerarius</b> group	

**Mixtus Group**

*Aedes mixtus* Edwards, figs 1, 4, 5, 7, 9, 13

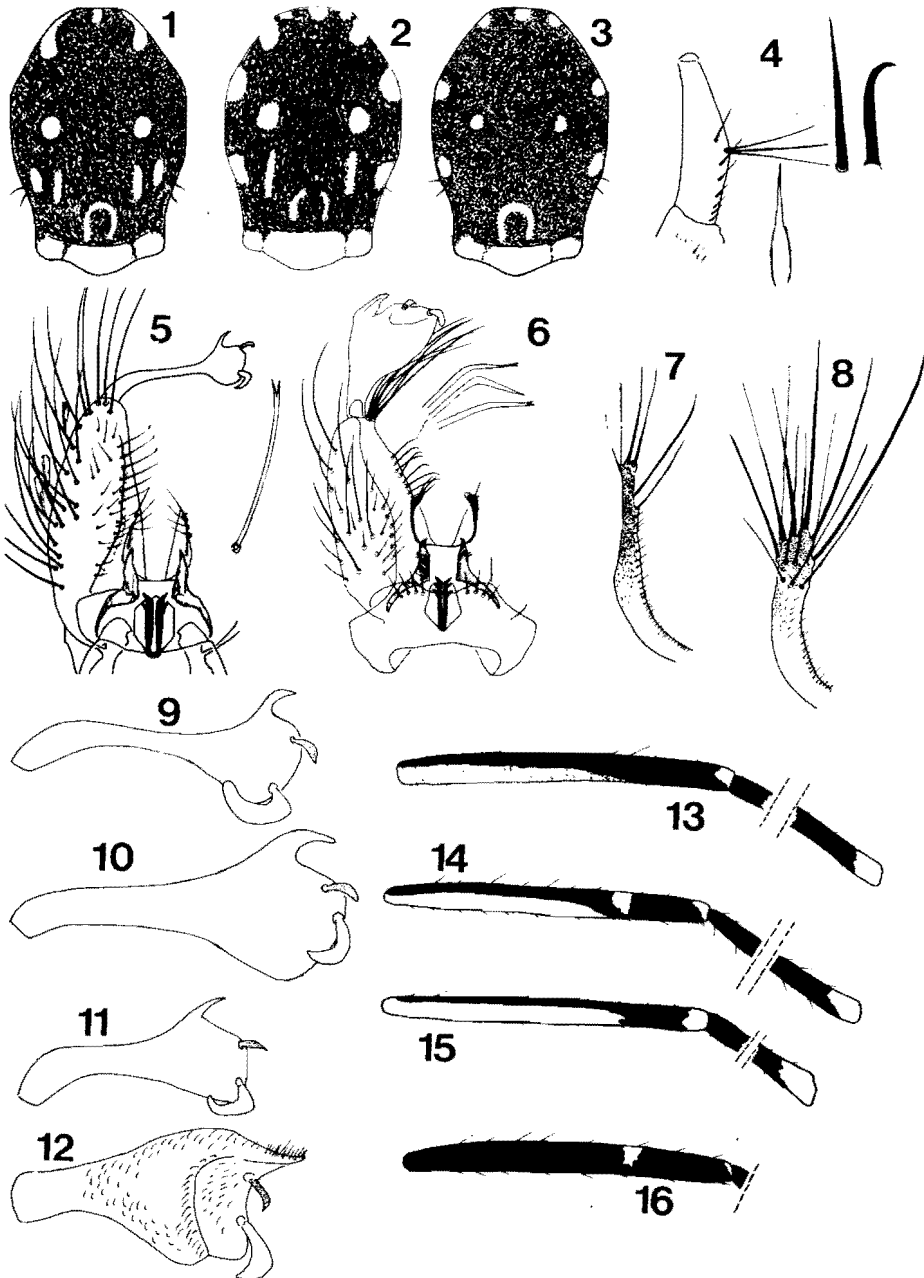
***Stegomyia argenteopunctata*** Theobald, 1901, *Mon. Cul.* 1: 316 (in part)

***Aedes mixtus*** Edwards, 1936, *Proc. Roy. ent. Soc.* 5: 49

***Aedes (Aedimorphus) mixtus*** Edwards, 1941, *Mos. Ethiop. Reg.*: 170; Muspratt, 1955, *J. ent. Soc. sth. Afr.* 18: 164

**FEMALE.** *Head:* decumbent scales of vertex broad, dark mesally, white posterolaterally, near frontal tuft and along orbital line; torus dark; proboscis dark, sometimes slightly pale ventrally; palpus dark. *Thorax:* integument of scutum and anterior half of pleurae black; scutum clothed mainly with narrow black scales, pale yellow scales scattered over posterior third as well as forming patches in supra-alar region and around bare space with some of the latter scales broad; scutum with clearly defined prescutal and posterior fossal maculae consisting of broad silvery-white scales (fig. 1); similar scales on scutellum, paratergite and antepronotum; postpronotum mainly bare, a few narrow dark scales dorsally and broad white scales adjacent post-pronotal setae; pleural scale patches with broad white scales, two patches on mesepisternum rather small and well apart; subspiracular, postspiracular and pre-alar scales absent; upper mesipimeron with 15-19 setae. *Abdomen:* terga dark with small round silvery-white basolateral patches invisible from above; sterna dark, with rather small white basolateral patches. *Legs:* mainly dark; femora with white knee-spots; femur III mainly dark on apical half (fig. 13); tibiae with white apical spot, that on III about as long as broad; posttarsi each with 2 claws, those on I and II equal, each unidentate, on III equal, simple. *Wing:* dark, with small white spot at base of costa. Wing 3.7 mm. Proboscis 2.1 mm.

**MALE.** Palpus longer than proboscis by about length of terminal segment, rather heavily setose, shaft with 43 setae, segment 4 with 107; terga with narrow basal bands, incomplete mesally; posttarsus I with claws unequal, both armed; II unequal, only smaller armed; III subequal, both simple. *Genitalia:* gonocoxite with row of 5 strong setae along tergomesal margin with forked apices (fig. 5); basal mesal lobe poorly developed, consisting of pigmented ridge with conical apex bearing about 3 setae (fig. 7); gonostylus with rather narrow arm, expanded on apical 0.25 into a



Figs 1-16. *Mixtus* group species of *Aedes*. 1. *Mixtus*, scutum. 2. *Bedfordi*, scutum. 3. *Minutus*, scutum. 4. *Mixtus*, siphon. 5. *Mixtus*, male genitalia. 6. *Minutus*, male genitalia. 7. *Mixtus*, basal mesal lobe. 8. *Bedfordi*, basal mesal lobe. 9. *Mixtus*, gonostylus. 10. *Microstictus*, gonostylus. 11. *Bedfordi*, gonostylus. 12. *Minutus*, gonostylus. 13. *Mixtus*, hindfemur, apex of tibia. 14. *Argenteopunctatus*, hindfemur, apex of tibia. 15. *Minutus*, hindfemur, apex of tibia. 16. *Argenteopunctatus*, midfemur.

quadrate bearing a curved dorsal horn and two large setae near apical margin, one being flat, curved, pointed, the other a curved, broad leaf (fig. 9). Proboscis 2.1 mm. Palpus 2.4 mm.

**LARVA.** *Head:* antenna strongly spiculate; seta 1-A inserted 0.4 from base, with 3-4 branches; seta 4-C placed rather far back, being level with or even slightly caudad of seta 5-C; seta 5, 6-C with 3 stout slightly plumose branches, about 0.5 length of head; seta 7-C with 5 branches. *Abdomen:* comb consisting of 16 spines with fine basal denticles; siphon curved dorsally, with an angulation ventrally at level of seta 1-S (fig. 4); pecten consisting of 8 spines, proximal spines with 3 basal denticles, distal spines rather long and slightly bent near apex; seta 1-S with 3 branches, 1.7 times as long as siphon width; ventral brush setae with 3-4 branches; anal papillae very long and slender, about 3 times length of saddle. SI 2.8. SL 2.3. PL 0.55. HL 0.48.

**TAXONOMIC DISCUSSION.** Due apparently to an oversight I failed to locate the ♂ holotype (GHANA, Kumasi) in the B.M. but Dr P. F. Mattingly assures me that it is present there. I did examine the ♂ *Stegomyia argenteopunctata* with mounted genitalia which Edwards transferred to this species from the *argenteopunctatus* type series.

In the female this species is probably inseparable from *microstictus*. In the material examined the slight differences in the number of upper mesepimeral setae between these two species were constant but it seems likely that this character would vary geographically. The two species are quite distinct on male genitalia and palpal setosity. Edwards separated this species from *punctothoracis* Theobald 1910 on the basis of the gonostylus which is clearly different in the two species.

**MATERIAL EXAMINED.** SOUTH AFRICA. *Transvaal:* Johannesburg (4 ♂, 5 ♀, 9 larvae), Leydsdorp (1 ♂). *Natal:* Oslo Beach (8 ♀, 8 ♂, 13 larvae, 2 pupae, 1 rearing), Dundee district (5 ♀, 4 ♂). RHODESIA. Salisbury (6 ♂, 5 ♀, 7 larvae, 2 rearings).

**BIOLOGY.** This is probably a widely ranging species with a broad tolerance to varying climatic conditions but because of likely confusion with *microstictus* its habits have been difficult to determine. Females, probably of *mixtus*, were frequently collected off man or large domestic animals on the South African highveld and the Rhodesian highlands, but never in large numbers and because of this it is probably of little economic importance. Larvae have been collected in temporary ground pools in grass or along swamp margins. This species, or *microstictus*, have been tested in small numbers for virus without success.

*Aedes microstictus* Edwards, fig. 10

**Aedes microstictus** Edwards, 1936, *Proc. Roy. ent. Soc.* 5: 50

**Aedes (Aedimorphus) microstictus** Edwards, 1941, *Mos. Ethiop. Reg.*: 170; Muspratt, 1955, *J. ent. Soc. sth. Afr.* 18: 165

**FEMALE.** Very like *mixtus*; slightly smaller; postpronotum apparently frequently devoid of broad white scales; upper mesepimeron with fewer setae, about 9-11. Wing 2.9-3.3 mm. Proboscis 1.9-2.1 mm.

**MALE.** Palpus lightly setose, shaft with 9 setae, segment 4 with 43. *Genitalia:* gonocoxite broader than related species; basal mesal lobe perhaps projecting more prominently at apex than in *mixtus*; gonostylus with relatively massive arm and large distal expansion with short, thick dorsal horn; centre and ventral margin of expansion moderately clothed with short setae (fig. 10). Proboscis 1.7 mm. Palpus 1.9 mm.



LARVA. Similar to *mixtus*.

TAXONOMIC DISCUSSION. Despite the close similarity to *mixtus* in the female and larva this is a clearly defined species on the male palpus and genitalia.

MATERIAL EXAMINED. SOUTH AFRICA. *Transvaal*: Pretoria (holotype ♂, B.M.). Pienaars River (15 ♂, 15 ♀, 24 larvae, 2 pupae, 7 rearings).

BIOLOGY. Rarely collected but it seems likely that this species is widely distributed in the warmer savannas of southern Africa. It has been collected blood-engorged in goat-baited net-traps.

*Aedes argenteopunctatus* (Theobald), figs 14, 16

*Stegomyia argenteopunctata* Theobald, 1901, *Mon. Cul.* 1: 316 (in part)

*Aedes* (*Aedimorphus*) *argenteopunctatus* Edwards, 1941, *Mos. Ethiop. Reg.*: 167; de Meillon, Parent & Black, 1945, *Bull. ent. Res.* 36: 97; Hopkins, 1952, *Mos. Ethiop. Reg.*: 170; Muspratt, 1955, *J. ent. Soc. sth. Afr.* 18: 164; Pao & Knight, 1970, *Mosq. Syst. News Letter* 2: 105

FEMALE. Smaller than *mixtus*; vertex with patch of narrow yellow decumbent scales in front; pale scales around bare space sometimes white and broadish; upper mesepimeral setae fewer, about same as *microstictus*, i.e. 9-11; femora II, III with conspicuous pre-apical silver spot anteriorly (figs 14, 16); terga II-V (sometimes all terga) with rather small but definite yellow mediobasal bands, not reaching lateral silver patches. Wing 3.0 mm. Proboscis 1.9 mm.

MALE. Palpus longer than proboscis by length of terminal segment, moderately setose, shaft with 34 setae, segment 4 with 104; terga with narrow silver basal bands, incomplete mesally. *Genitalia*: similar to *mixtus*. Proboscis 1.6 mm. Palpus 1.9 mm.

LARVA. Similar to *mixtus*.

TAXONOMIC DISCUSSION. This is an easily identifiable species from the pre-apical spots on the femora.

MATERIAL EXAMINED. SOUTH AFRICA. *Transvaal*: Tzaneen (1 ♀). Sabie River Bungalows (2 ♀). NATAL: Josini (1 ♀). Ndumu (2 ♀, 3 ♂). Mposa (12 ♀, 13 ♂, 6 larvae, 2 pupae, 3 rearings). RHODESIA. Salisbury (holotype ♀, B.M.). MOÇAMBIQUE. Lourenço Marques (1 ♀).

BIOLOGY. This species has not been encountered frequently in South Africa. In the coastal region of Natal it has been collected during daylight biting man in evergreen riverine forest. It is common on the Moçambique coast (Worth and de Meillon, 1960) where Semlike Forest virus was isolated from it (McIntosh, Worth *et al.*, 1961).

*Aedes bedfordi* Edwards, figs 2, 8, 11

*Aedes bedfordi* Edwards, 1936, *Proc. Roy. ent. Soc.* 5: 50

*Aedes* (*Aedimorphus*) *bedfordi* Edwards, 1941, *Mos. Ethiop. Reg.*: 171; Muspratt, 1959, *J. ent. Soc. sth. Afr.* 22: 67

FEMALE. Large patch of dark scales on vertex; proboscis entirely dark; in addition to the two pairs of silver maculae as in *mixtus*, scutum with broad silver scales

as follows (fig. 2); 3 patches on anterior promontory, one patch each on angle and supra-alar region, as scattered scales around bare space, and a longitudinal line laterally of posterior dorsocentral line; small patch of broad silver subspiracular scales present; femur III with silver scales on basal 0.9 anteriorly. Wing 3.4 mm.

MALE. Palpus lightly setose; broad silver scales around prescutellar bare space; terga with broad silver bands. *Genitalia* (fig. 11): apex of basal mesal lobe rather more swollen than related species and with about 12 long setae almost reaching apex of gonocoxite (fig. 8). Apex of gonocoxite with a few long setae somewhat as in *minutus*.

LARVA. Unknown.

**TAXONOMIC DISCUSSION.** This is a clearly-defined species on the basis of the additional silver scale patches on the scutum. Because of the broad nature of these scales, the pattern they form and the shape of the gonostylus this species is closest to members of the *mixtus* group although it is not yet known whether the larva has the characteristic bent siphon of the other members of this group.

**MATERIAL EXAMINED.** SOUTH AFRICA. Natal; Ntambanana (holotype ♀, BM, 1 ♀). Ndumu (1 ♂, 2 ♀). Ubombo (1 ♂).

*Aedes minutus* (Theobald), figs 3, 6, 12, 15

*Stegomyia minuta* Theobald, 1901, *Mon. Cul.* 1: 319

*Ochlerotatus minutus* Edwards, 1912, *Bull. ent. Res.* 3: 21 (in part); 1917, *Ibid.* 7: 219

*Aedes (Aedimorphus) minutus* Edwards, 1941, *Mos. Ethiop. Reg.* 177; Hopkins, 1952, *Ibid.* 178 (*nec minutus*); Muspratt, 1956, *J. ent. Soc. sth. Afr.* 19: 37; Hamon *et al.*, 1961: 375

FEMALE. *Head*: decumbent scales of vertex mainly broad, but narrow on occiput and orbital line; proboscis, palpus dark. *Thorax*: prescutal and fossal maculae which may be rather indefinite with narrow yellow scales; similar scales forming indefinite pattern on anterior promontory, scutal angle, supra-alar region, around bare space and scattered throughout most of scutum (fig. 3); scutellum with broad, silver scales; paratergal, anteprenotal scales yellow, broad, sometimes also with a few narrow scales; postpronotum with broad yellow and narrow dark scales; pleural scale patches small, scales broad, white; small subspiracular patch present; postspiracular scales absent. *Abdomen*: terga with silvery white basolateral patches, basal bands absent; sterna with rather narrow basal bands, somewhat incomplete mesally. *Legs*: white apical spot on tibia III slightly larger than others of the *mixtus* group, being more like *filicis* group (fig. 15). Wing 2.8–3.2 mm. Proboscis 1.6 mm.

MALE. Palpal shaft with 13 setae, segment 4 with 61. *Genitalia*: apex of gonocoxite with tuft of 10 long setae; row of 8 strong bent setae with forked apex at middle of tergomesal margin of gonocoxite (fig. 6); basal mesal lobe as in *mixtus*; gonostylus with short massive arm and broad triangular expansion, latter moderately setose; expansion with finger-like hairy prominence dorso-apically, a blade and leaf on apical margin (fig. 12).

LARVA. *Head*: setae 5, 6, 7–C with 3–5, 2–3 and 3–5 lightly plumose branches respectively. *Abdomen*: comb with 17 spines with fine basal fringe; siphon shaped as in *mixtus*; pecten with 7–9 spines proximal 3–4 with basal denticles, distal spines widely-spaced, simple, long and straight; apical spine inserted just beyond seta 1–S; seta 1–S with 4 branches, more than twice siphon width; saddle spiculate on apical margin. SI 2.5.

**TAXONOMIC DISCUSSION.** This is an annectant species, with the broad vertical scales and larval features of the *mixtus* group while the scutal scalation is closest to that of *tarsalis*. The setal tuft on the gonocoxite and the shape and setosity of the gonostylus are somewhat divergent from members of both groups as they occur in southern Africa. In the female this species is likely to be confused with *tarsalis* from which it can only be separated by the broad vertical scales and possibly by the absence of silvery white scutellar scales in *tarsalis* from South Africa.

**MATERIAL EXAMINED.** SOUTH AFRICA. *Natal*: Ndumu (2 ♂, 5 ♀), Tete Pan (1 ♂, 1 larval pelt), M'candusi (1 ♂). *Transvaal*: Skukuza (1 ♂). RHODESIA, Salisbury (holotype ♀, BM), Chipinda Pools (1 ♀). MOÇAMBIQUE. Near Lourenço Marques (2 ♀).

**BIOLOGY.** Wesselsbron virus has been isolated from this species in Natal (Worth *et al.*, 1961).

### **Filicis Group**

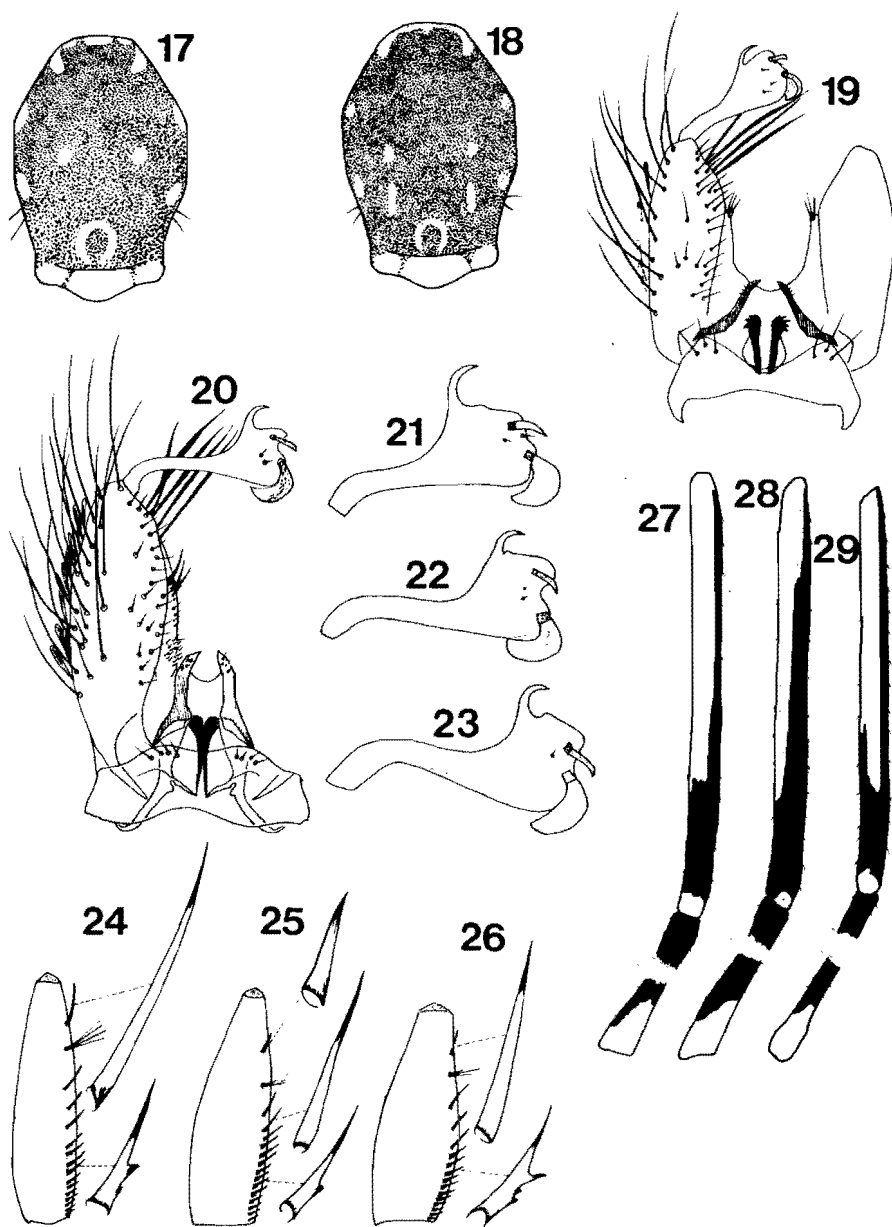
*Aedes filicis* Ingram & de Meillon, figs 17, 19, 21, 24, 29

**Aedes (Aedimorphus) filicis** Ingram & de Meillon, 1927, *Pub. S. Afr. Inst. Med. Res.* **22**: 58; Edwards, 1941, *Mos. Ethiop. Reg.*: 174; Hopkins, 1952, *Ibid.*: 174; Muspratt, 1955: 165 (in part)

**FEMALE.** *Head*: decumbent scales of vertex narrow, dark mesally, white laterally, on occiput and orbital line; erect scales dark; palpus, proboscis dark; torus pale, dark scales mesally. *Thorax*: scutum lightly clothed with narrow dark scales, scattered yellow scales between dorsocentrals and a conspicuous pattern of narrow white scales as follows: anterior promontory, prescutal macula (both areas sometimes with a few broadish scales), scutal angle, posterior fossal macula, supra-alar region and around bare space (fig. 17); scutellum with broad, white or silvery-white scales; paratergite, antepnotum with broad white scales; similar scales present on all remaining pleural patches; postspiracular scales usually absent, rarely 1–2 scales present; subspiracular patch small, usually about 4 scales; pre-alar scales absent; postpronotum with narrow dark scales dorsally and a few broad white scales caudally. *Abdomen*: terga dark with basolateral silvery white patches not visible from above; sterna dark with broad white or yellow basal bands. *Legs*: white line sometimes present on basal 0.5 of femur I along ventral margin; all femora with white knee spots; white apical spots present on all tibiae, that on III twice as long as broad (fig. 29); claws of post-tarsi I, II armed, of III simple. *Wing*: dark with white spot at base of costa. Wing 3.9–4.2 mm. Proboscis 2.6 mm.

**MALE.** Decumbent white scales on vertex broader; palpus slightly longer than proboscis, very lightly setose, shaft with 6 setae, segment 4 with 27; proximal terga sometimes with basal bands, incomplete mesally. *Genitalia*: gonocoxite with large patch short setae on tergal surface, tergoanal margin with long setae, broadened about middle (fig. 19); basal mesal lobe rather inconspicuous, consisting of small conical prominence, at about 0.66 from base of gonocoxite, with a few small setae; gonostylus expanded on apical third into a quadrate, rather like members of the *mixtus* group, but with ventral margin of gonostylus straight; quadrate with curved dorsal horn, and on its apical margin, one slightly curved, flat, pointed seta and one broad, curved leaf-like seta (fig. 21); paraproct with about 3 apical setae. Proboscis 1.8 mm. Palpus 2.0 mm.

**LARVA.** Antenna spiculate; seta 1–A, inserted at about 0.5, with 6 branches;



Figs 17-29. *Filicis* group species of *Aedes*. 17. *Filicis*, scutum. 18. *Tarsalis*, scutum. 19. *Filicis*, male genitalia. 20. *Veeniae*, male genitalia. 21. *Filicis*, gonostylus. 22. *Veeniae*, gonostylus. 23. *Tarsalis*, gonostylus. 24. *Filicis*, siphon. 25. *Veeniae*, siphon. 26. *Tarsalis*, siphon. 27. *Tarsalis*, hindfemur, apex of tibia. 28. *Veeniae*, hindfemur, apex of tibia. 29. *Filicis*, hindfemur, apex of tibia.

seta 4-C about level with 5-C; seta 5-C with 7-8 branches, 6-C with 5-7 branches, 7-C with 12 branches, all these setae plumose; comb with 28-35 scales; pecten with 18-19 spines, distal 3-4 spines widely separated, most distal spine long and thin, inserted beyond seta 1-S; seta 1-S with 3-4 branches, about 0.5 siphon width (fig. 24); saddle complete, without spicules on distal margin; setae 1-X, 2-X simple, 3-X with 8 branches; ventral brush with about 3 precratal setae and 8 setae on grid; these setae with about 12 branches. SI. 4,6-5,3. SL. 3,7-3,9. PL. 0,75-0,78. HL. 0,66-0,70.

**TAXONOMIC DISCUSSION.** The male of the type series was selected as lectotype. The specimen labelled "type ♀" was selected as the allotype. This is a distinctive species which may be recognised from the lightly setose male palpus, the conspicuous scutal pattern consisting of narrow white scales, the broad silvery white scutellar scales and, in the female, the unbanded terga. The light setosity of the male palpus and white scaling of the scutal pattern serve to differentiate this species from *tarsalis* and *veeniae* while the broad silvery white scutellar scales also differentiate it from *veeniae*. Two females from the Ivory Coast among the ORSTOM collection labelled as *filicis*? lack the typical scutal pattern and should not be regarded as this species. The long flattened setae on the sternomesal margin of the gonocoxite occur in all three species of the group and are absent in the *mixtus* group. The long setae at the apex of the gonocoxite in *minutus* and *bedfordi* however may be homologous to these setae.

**MATERIAL EXAMINED.** SOUTH AFRICA. *Cape*: Blauwkrantz (1 ♂, 1 ♀), Kaaiman's Gat (3 ♂), Knysna (4 ♀). *Transkei*: Embotyi (2 ♂), Port St Johns (2 ♂). *Natal*: Eshowe (Lectotype ♂, BM, allotype ♀, 2 ♀), Ntambanana (1 ♀), Oribi Gorge (5 ♀, 6 ♂, 13 larvae, matched to adult), Kosi Bay (2 ♀), Gwalaweni (1 ♂), Ingeli Forest (1 ♂, 1 ♀), St Winfreds (1 ♀).

**BIOLOGY.** This species frequents the evergreen forests along the coastal regions of the Cape, Transkei and Natal. Muspratt (1955) has frequently collected females biting man in these forests. Larvae have usually been collected from ground pools in forest but the collection referred to above from the Oribi Gorge was from a rock pool in a small forest stream with overhanging vegetation.

***Aedes veeniae* spec. nov., figs 20, 22, 25, 28**

**FEMALE.** *Head*: decumbent scales of vertex narrow, mainly yellow with dark mesal spot in front. *Thorax*: scutal integument reddish brown; background scalation of scutum with narrow dark scales and scattered narrow yellow scales; narrow yellow scales forming rather indistinct scutal pattern as in *tarsalis* but pale posterior fossal line rather frequently present; scutellar scales yellow, with sometimes a few dark scales on median lobe; scales on median lobe normally narrow, sometimes a few broadish; on lateral lobe either narrow or broadish, or a mixture of these; paratergal, anteprenotal scales pale yellow, narrow or broadish; postpronotum with a few narrow dark scales dorsally, sometimes also a few pale broadish scales caudally; postspiracular scales absent, rarely 1-4 broad scales; pleural scale patches small, with broad, white or creamy scales. *Abdomen*: terga with white basolateral patches extending apically to about half length of segment; white or creamy basal bands usually well-developed and joining lateral patches on terga III and IV, as small mesal spot on II and V; terga VI and VII without basal band or spot; sometimes all terga dark basomesally except for

small pale spot on terga I–III; sterna white with broad dark apical bands. *Legs*: small creamy kneespot present on all femora; pale line sometimes present on basal 0.5 of femur I along ventral margin; tibiae with white apical spot, that on III about twice as long as broad (fig. 28); posttarsal claws of all legs equal, on I and II both armed, on III simple. *Wing*: sometimes a few pale scales at base of costa. Wing 3.8 mm. Proboscis 2.7 mm.

**MALE.** Decumbent scales of vertex narrow mesally, but with broad white scales at sides which sometimes tend to encroach on mesal region of vertex; palpus barely longer than proboscis, moderately setose, shaft with 20–23 setae, segment 4 with 67–82; scutellar scales broader, sometimes even median lobe with entirely broad scales but these scales always yellow or creamy, not silvery white; tergal basal bands conspicuously white, complete and broad; tergum VII usually entirely white; claws of posttarsi I, II unequal, on I both armed, on II only smaller armed, of III equal, simple. *Genitalia*: similar to *flicis* (figs 20, 22). Proboscis 2.2 mm. Palpus 2.3 mm.

**LARVA.** Seta 1–A with 6–8 branches; setae 5–C with 8–12 branches, 6–C with 7–10 branches, 7–C with 15 branches, all these setae plumose; comb with 20–28 scales; pecten with 16–25 spines, distal 2 or 3 widely separated, simple, most distal spine inserted at about halfway between seta 1–S and apex of siphon; this spine short and thick compared to *flicis* and *tarsalis* (fig. 25); remaining pecten spines with 1–3 basal denticles; seta 1–S with 3–5 branches, about 0.6 width of siphon. SI 3.5–4.0. SL 3.3–3.7. PL 0.77–0.84. HL 0.58–0.66.

**TAXONOMIC DISCUSSION.** This species is unique among members of the *mixtus* and *flicis* groups and perhaps also among members of Edwards' *tarsalis* group in having narrow, yellow scutellar scales, although on the basis of the male genitalia and larva and other minor features it clearly belongs within the *flicis* group. It is probably closest to *yangambiensis* de Meillon and Lavoipierre of which the female is unknown. It differs from this species in the shape of the distal expansion of the gonostylus and in having a narrower seta on the apical margin of this expansion. In the female it can also be separated from *flicis* and *tarsalis* by the basal tergal bands. In this respect it could be confused with *albocephalus* but *veeniae* lacks the white line on the basal sixth of the costa, and possesses a poorly-developed postspiracular scale patch. Although the larvae of the three members of the *flicis* group are very similar, on the available material, it is possible to separate these species on the length and shape of the most distal (subapical) pecten spine, which varies from a very long and thin spine in *flicis* (0.2 mm) to a short broad spine in *veeniae* (0.08 mm), and with *tarsalis*' spine being intermediate in length (0.1 mm). All these species lack the cluster of subapical spines characteristic of *pseudotarsalis* Someren, 1946.

**MATERIAL EXAMINED.** SOUTH AFRICA. *Natal*: Oslo Beach (12 ♂, 8 ♀, 13 larvae, 2 pupae, 2 rearings), Kosi Bay (3 ♂, 3 ♀, 3 larvae), Mposa (18 ♀, 13 ♂, 21 larvae, 2 pupae, 6 rearings), La Mercy (2 ♀).

Holotype, ♀, reared in isolation from female M1168D collected by me at Oslo Beach, NATAL, SOUTH AFRICA. Allotype, ♂, and paratypes (4 ♀, 8 ♂), reared from same female as holotype. All the foregoing specimens carry the number of their dam, M1168D, and the accession number 7236. The holotype, allotype and 6 paratypes deposited at SAIMR; two paratypes each will be deposited at the BM, ORSTOM and the United States National Museum (USNM), respectively. This species is dedicated

to my wife in recognition of the assistance and encouragement she has given me in my work.

**BIOLOGY.** So far as is known this species is confined to the coastal plain of Natal, where it is fairly common. Small numbers have been tested for virus without success. The material from Kosi Bay was collected as larvae in a crab hole in the bed of a stream but it is possible that the eggs or larvae had by chance been washed into the hole.

*Aedes tarsalis* (Newstead), figs 18, 23, 26, 27

**Duttonia tarsalis** Newstead, 1907, *Ann. Trop. Med. Parasit.* **1**: 18

**Reedomyia biannulata** Theobald, 1907, *Mon. Cul.* **4**: 263

**Reedomyia bipunctata** Theobald, 1910, *Ibid.* **5**: 256

**Ochlerotatus minutus** Edwards, 1912, *Bull. ent. Res.* **3**: 21 (in part)

**Ochlerotatus tarsalis**: Edwards, 1916, *Ibid.* **7**: 219

**Aedes (Aedimorphus) tarsalis**: Edwards, 1941, *Mos. Ethiop. Reg.*: 174; Hopkins, 1952, *Ibid.*: 176; Muspratt, 1955, *J. ent. Soc. Sth. Afr.* **18**: 165 (in part); Hamon *et al.*, 1961, *Bull. Soc. Path. exot.* **54**: 381; Pao & Knight, 1970, *Mosq. Syst. News Letter* **2**: 114

**FEMALE.** *Head*: pale decumbent scales of vertex pale yellow. *Thorax*: dark scales of scutum much darker, mostly black, scutal pattern of pale scales much as in *filicis* but these scales yellow or pale yellow and less conspicuous (fig. 18); posterior fossal macula sometimes very small; additional patch of pale yellow scales present as line laterally of posterior dorsocentral line; scutellar scales broad, dull white, sometimes slightly creamy; anteprenotal scales variable, usually a mixture of broad white and narrow yellow scales. *Abdomen*: small creamy mesal spot sometimes present on terga I–III. Wing 4.2 mm. Proboscis 2.4 mm.

**MALE.** Palpus about twice as hairy as *filicis*, shaft with 15–23 setae, segment 4 with 64–82; scutellar scales silvery white; anteprenotal scales broad and white; terga with well-developed silvery white basal band; claws of posttarsus I unequal, both armed, of II unequal, only smaller armed, of III equal, simple. *Genitalia*: same as *filicis* (fig. 23). Proboscis 2.2–2.3 mm. Palpus 2.3 mm.

**LARVA.** Seta 5–C with 7–9 branches, 6–C with 6–9 branches, 7–C with 9–10 branches; comb with 20–31 scales; pecten with 14–19 spines, most distal spine almost subapical as in *filicis* but not as long (fig. 26). SI 3.5–3.9. SL 3.5–3.6. PL 0.79–0.81. HL 0.68–0.75.

**TAXONOMIC DISCUSSION.** Although the holotype (♂ Kisui, Zaire) is reported by Stone *et al.*, (1959) as being in the BM it was not seen there by me. This is the first record of this species from southern Africa and the above description refers to a large series bred out in isolation from females collected at Oslo Beach, Natal, in 1974 which, however, I rather hesitantly include under *tarsalis* mainly because of the limited amount of *tarsalis* material, particularly females, from outside of southern Africa that I have been able to examine but also because of the rather dull white scutellar scales in the female. In none of the South African females are the scutellar scales silvery white as in *filicis* or *minutus*. It would seem also that *tarsalis* is an ill-defined species subject to variation and in which identifications have apparently been largely based on the gonostylus. In southern Africa, at least, this character fails to differentiate *tarsalis* from *filicis* or *venetae*. According to Hopkins (1952) there is also variation in the larva. I am also including under *tarsalis* specimens from South Africa previously identified as *filicis* but lacking the white scutal pattern and exceptionally lightly setose male palpus of that

species. The latter character has been compared in *tarsalis* males from various countries; the results are shown in Table 1.

TABLE 1. Number of setae on the palpus of *Aedes tarsalis* males from various countries.

Specimen and Museum	Locality	Number setae	
		Shaft	Seg. 4
Reedomyia biannulata (BM)	Sierra Leone	12	63
tarsalis (ORSTOM)	unknown	8-9	45
" "	Tanzania	10	41
" "	Cameroun	13-15	57
" "	Ivory Coast	10-11	38-44
" (SAIMR)	Embotyi, Transkei	10	47
" "	Uvongo, Natal	11	50-56
" "	" "	14	54
" "	Oslo Beach "	20	67
" "	" "	23	82
" "	" "	15	64

It will be noted that the males from Embotyi and Uvongo seem closer to *tarsalis* from East and West Africa than the three males from Oslo Beach but the slight differences may not be significant. However, the females from which the Oslo Beach series was bred were collected in open parkland without rock pools in the vicinity whereas the Uvongo material was obtained from rock pools in forest indicating possible habitat differences suggestive that all the South African material may not be conspecific. The classification of this material as *tarsalis* should be regarded only as tentative until *tarsalis* is better known.

In the female this species is very similar to *minutus* from which it can be differentiated by the narrow vertical scales and in the Oslo Beach series, at least, by the dull white scutellar scales, the larger size, blackish background scalation of the scutum and attenuated basal tergal bands.

MATERIAL EXAMINED. GHANA. Obuasi (bipunctata type ♀, BM). SOUTH AFRICA. Natal; Oslo Beach (21 ♂, 21 ♀, 13 larvae, 4 pupae, 5 rearings), Uvongo (5 ♂, 2 ♀, 5 larvae), Oribi Gorge (1 ♀), Gwalaweni (1 ♀). Cape; Port St. Johns (1 ♂). Transvaal; White River (1 ♂), Pongola (1 ♀). See also "TAXONOMIC DISCUSSION".

BIOLOGY. In South Africa this is a coastal species distributed along the subtropical eastern seaboard. Because of confusion in the past with *filicis* and perhaps *albocephalus* and *minutus* this species is probably not as rare as records indicate. It was certainly quite common at Oslo Beach during February 1974.

Albocephalus Group

Aedes albocephalus (Theobald), figs 30, 31, 32, 33

Stegomyia albocephala Theobald, 1903, Mon. Cul. 3: 140;

Ochlerotatus albocephalus: Edwards, 1915, Bull. ent. Res. 5: 276

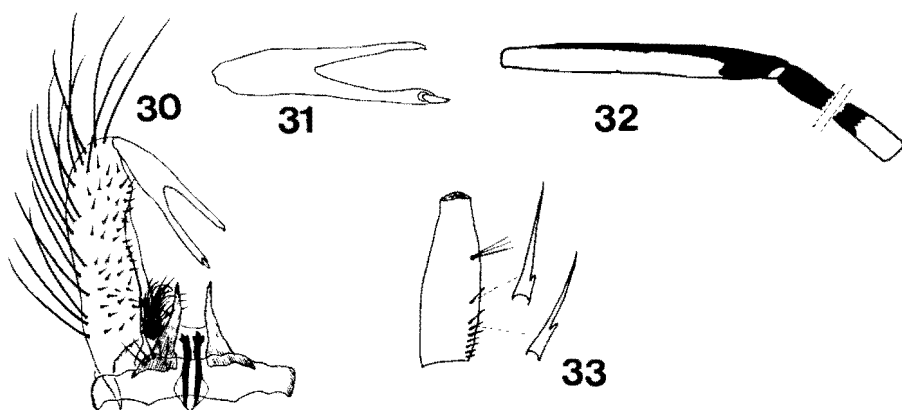
Aedes albocephalus: Edwards, 1941 Mos. Ethiop. Reg.: 177; Haddow, Someren, Lumsden,



Harper & Gillett, 1951, *Bull. ent. Res.* **42**: 223; Hopkins, 1952, *Mos. Ethiop. Reg.*: 181; Muspratt, 1955, *J. ent. Soc. sth. Afr.* **18**: 166; Someren, Teesdale & Furlong, 1955, *Bull. ent. Res.* **46**: 478; Hamon, Arbounenc & Noel, 1955, *Ann. Parasit. hum. comp.* **30**: 278

**FEMALE.** *Head*: decumbent scales of vertex narrow, sometimes a few broadish, largely creamy to pale yellow, small dark patch in frontal area; erect scales dark, a few pale in front; proboscis dark, sometimes palish below on middle third; palpus dark; torus with small patch black scales mesally. *Thorax*: scutal scales narrow, usually largely pale, on anterior 0.6 mixed brown, golden and yellow, on posterior 0.3 mostly pale yellow; when scutal scales predominantly dark on anterior 0.6 pattern of golden scales evident on anterior promontory, prescutal macula, scutal angle, posterior fossal line and supra-alar region; scales on scutellum yellow or creamy, on median lobe usually all narrow, rarely some broadish, on lateral lobe narrow or broad, or mixture of these; pleural scales pale yellow to creamy; 2-15 broadish post-spiracular scales; pre-alar scales absent; one large subspiracular scale patch, sometimes with additional small patch. *Abdomen*: terga with creamy or white basolateral patches; rather narrow basomesal bands not reaching lateral patches, widest on terga II-IV in which apical margin rounded, narrowing on distal terga, tending to form median spot on terga V and VI, sometimes absent on VII; sterna creamy-white with narrow dark apical band. *Legs*: femora with pale knee spot, rather smaller than usual, barely present on femora I, II; femur I with narrow pale broken line on basal half; tibiae I, II with small pale apical spot, tibia III with conspicuous silvery-white apical spot, about twice as long as broad (fig. 32). *Legs*: extensively pale behind sometimes even on tarsomere I; posttarsi I, II claws equal, armed, on III simple. *Wing*: dark, creamy line anteroventrally on basal sixth of costa. Wing 3.1 mm.

**MALE.** Pale decumbent scales on vertex frequently almost entirely broad; proboscis entirely dark below; palpus longer than proboscis by 0.75 of segment 5, strongly setose, shaft with 30-40 setae, segment 4 with 90-110; scutal scales paler, on



Figs 30-33. *Aedes albocephalus*. 30. Male genitalia. 31. Gonostylus. 32. Hindfemur, apex of tibia. 33. Siphon.

anterior 0.6 mostly golden, on posterior 0.3 mostly pale yellow; postspiracular scales usually absent; median lobe of scutellum more frequently with broad scales; tergal bands more complete, even on distal terga; basolateral patches absent; knee-spot absent on femora I, III; femur I all dark in front. *Genitalia*: basal mesal lobe located at base of gonocoxite, bearing clump of about 20 closely-spaced setae (fig. 30); these setae thin, pale, bent towards base; gonostylus forked on apical half, ventral arm broader and longer, bearing pigmented blade-like apical claw (fig. 31); paraproct without apical setae.

**LARVA.** Seta 5-C with 6-8 branches, 6-C with 4-6, 7-C with 6-8, these setae plumose; comb consisting of 14-15 spines; siphon rather short; pecten with 7-9 long, pointed spines, each with one or two basal denticles; seta 1-S inserted well beyond distal pecten spine, with 2-3 branches (fig. 33). SI 3.2. SL 3.1-4.2. PL 0.45-0.50. HL 0.61-0.70.

**TAXONOMIC DISCUSSION.** In his classification of the Culicidae Edwards (1932) placed *albocephalus* in his Group D which included *abnormalis* and related species, while later in his revision of Ethiopian Culicidae, he placed it among the *tarsalis* group. As the scutellar scales of *albocephalus* are never broad and silvery white there would appear to be no reason for the latter grouping. The conspicuous white apical spot on the hind tibia and the distinctive gonostylus also exclude this species from the *abnormalis* group. While the male genitalia and the presence of larval comb spines, as distinct from scales, suggest some affinity with the *dentatus* group several external features of the adult are quite different and it seems logical that *albocephalus* be kept apart from all other species groups.

There is some variation of scutellar scales in South Africa. Specimens from the Cape Province tend to have broader and paler scales than those from farther north. Specimens from Knysna have darker sterna, being entirely dark except for pale basolateral patches.

The pale line at the base of the costa instead of the usual spot serves to differentiate this species from all related ones. The narrow yellow scutellar scales, postspiracular scales and the tergal bands are also useful differentiating characters.

**MATERIAL EXAMINED.** GAMBIA (holotype ♂, BM). SOUTH AFRICA. Cape; Blauwkrantz (1 ♀), Plettenberg Bay (1 ♀, 1 ♂, 3 larvae, 1 rearing), Knysna (6 ♀, 6 ♂, 1 rearing), Mossel Bay (1 ♀), Port Alfred (1 ♀, 1 ♂), Port St. Johns (1 ♀, 1 ♂). Natal; Oslo Beach (16 ♀, 6 ♂, 7 larvae, 4 rearings), Isipingo (1 ♀, 1 ♂), Mposa (10 ♀, 4 ♂, 1 rearing), Richards Bay (3 ♀, 3 ♂, 4 larvae), Ndumu (1 ♀, 1 ♂, 3 larvae, 1 rearing), Kosi Bay (6 ♀). MOZAMBIQUE. Lourenço Marques (1 ♀, 6 ♂). RHODESIA, Salisbury (1 ♀).

**BIOLOGY.** In South Africa this is a species of the coast and, in northern Natal of the coastal plain where it is one of the most prevalent *Aedimorphus* species but in the tropics it is also present at inland localities as it occurs in Rhodesia, Uganda and at inland localities in Mozambique, although apparently in smaller numbers. While able to breed in fresh water it is probably better adapted to saline waters and on the Cape coast Muspratt (1961) found it breeding in extremely large numbers in sea water in tidal pools. It feeds readily on the larger domestic mammals and sometimes also on man. Middelburg virus has been isolated from it in South Africa (Worth *et al.* 1961) but as it has been tested for virus in large numbers it seems unlikely that it can be

important as a viral vector in southern Africa. It has, nevertheless, some potential as a "nuisance" species, because of its large numbers in coastal localities.

### **Leesoni Group**

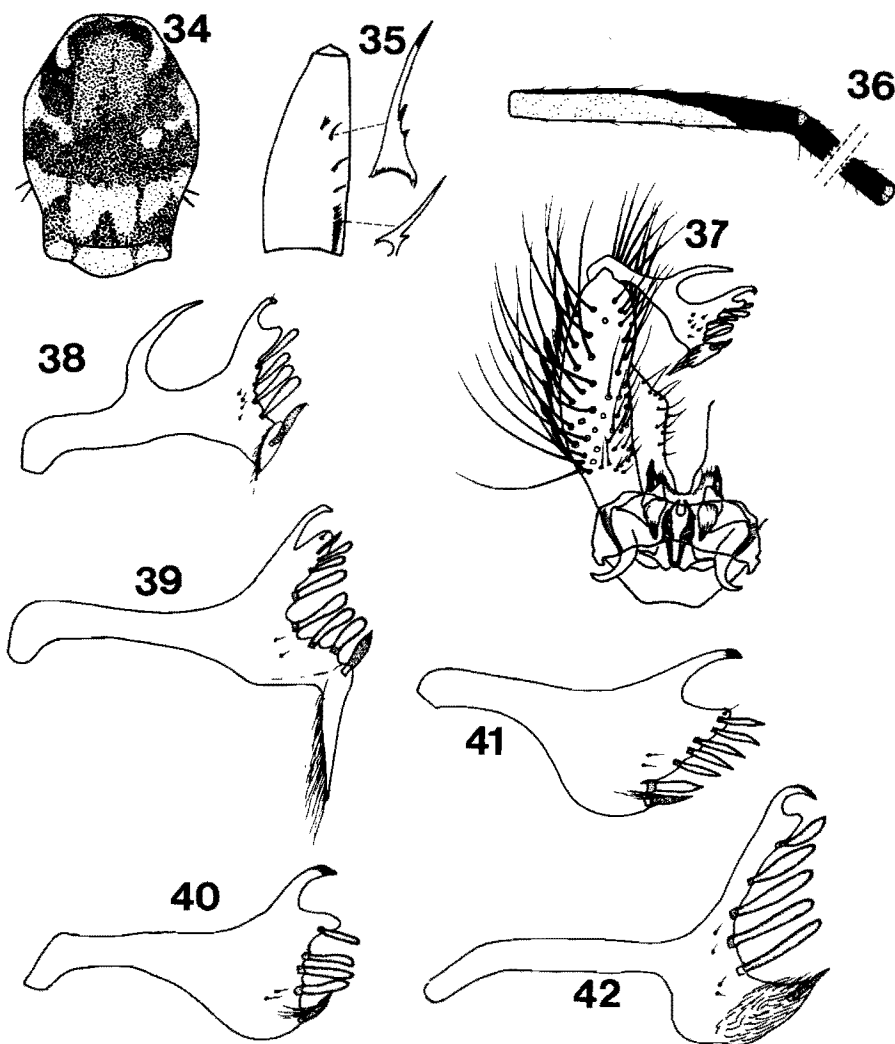
*Aedes leesoni* Edwards, figs 34–38

**Aedes (Aedimorphus) leesoni** Edwards, 1932, *Bull. ent. Res.* **23**: 562; 1941, *Mos. Ethiop. Reg.*: 183; Muspratt, 1959, *J. ent. Soc. sth. Afr.* **22**: 68

**FEMALE.** *Head*: decumbent scales of vertex narrow, mainly pale yellow with small patch bronze scales in front; erect scales mainly dark, a few pale anteriorly; proboscis, palpus dark; torus usually with dark scales mesally. *Thorax*: scutum with about equal number dark brown and whitish or pale yellow scales; latter forming pattern as follows: broad, median band of scattered scales between dorsocentrals on anterior half or more, anterior promontory, prescutal macula, scutal angle, variably confluent with latter a broadish band on posterior fossal line, broad transverse band at level of supra-alar region (broken by dorsocentrals), laterally of bare space (fig. 34); scales of scutellum pale yellow or creamy, narrow and broad on median lobe (sometimes entirely narrow), broad on lateral lobe; paratergite, anteprenotum, postpronotum (densely scaled) with pale yellow narrow scales; paratergite and postpronotum sometimes also with broadish scales; pre-alar knob usually bare, rarely a few broad scales; postspiracular scales present, sometimes numerous; usually 2 subspiracular patches with broadish scales; mesepisternal and mesepimeral scale patches large, scales broad, creamy; propleural scales extending on to prosternum. *Abdomen*: terga with well-developed creamy basal bands, narrowing laterally, just reaching large lateral pale patches; sterna mostly pale, dark apicolateral patches, sometimes joining mesally on distal segments to form apical bands. *Legs*: femur I with pale line on basal half of ventral margin; femora with small but definite creamy knee-spots; tibiae with creamy apical spots, that on III usually less than tibial diameter (fig. 36); posttarsi I, II with claws equal, armed, III equal, simple. *Wing*: dark, a few pale scales at base of costa. Wing 3.4–3.6 mm.

**MALE.** Palpus longer than proboscis by length of segment 5, strongly setose, shaft with 63 setae, segment 4 with 123; scutal scales almost entirely pale; usually only a few postspiracular scales, sometimes absent; scutellar scales broader, sometimes all broad; paratergal, postspiracular scales usually broad. *Genitalia*: gonocoxite strongly setose on apical half of sternomesal margin, angulated at middle mesally; basal mesal lobe weakly differentiated as pigmented ridge at base of gonocoxite, with 4 setae apically (fig. 37); gonostylus expanded distally into diverging dorsal and ventral parts, and bearing curved dorsal horn at about middle of arm; dorsal part of terminal expansion with a smaller curved horn, ventral part with pubescent enlargement bearing blade-like seta; apical margin of gonostylus indented, bearing row of about 4 spatulate setae (fig. 38).

**LARVA.** Antennae about as long as head, infusate on apical half; seta 1–A with 6–7 subplumose branches; seta 5–C with 2–3 branches, 6–C double, 7–C with 4 branches; these seta subplumose; comb with 17–18 scales; seta 1–S very small, with 4 branches; pectin, with 16–20 closely placed spines, each bearing basal denticle, and 2 or 3 apical spines widely spaced, simple or denticulate (fig. 35); saddle incomplete, spiculate on dorsal part of apical margin; 2–X with 12 branches; 3–X single; ventral brush with 1–2 precratal setae and 10 setae on grid, with 12–14 branches; anal papillae tapering to point, about 1.5 times as long as saddle. SI 3.6. SL 4.0. PL 0.53. HL 0.61.



Figs 34-42. *Leesoni* group species of *Aedes*. 34. *Leesoni*, scutum. 35. *Leesoni*, siphon. 36. *Leesoni*, hindfemur, apex of tibia. 37. *Leesoni*, male genitalia. 38. *Leesoni*, gonostylus. 39. *Alboventralis*, gonostylus. 40. *Eritraeae*, gonostylus. 41. *Karooensis*, gonostylus. 42. *Dalzieli*, gonostylus.

**TAXONOMIC DISCUSSION.** The gonostylus of South African specimens is similar to that described for subspecies *vena* Lewis (1944) which would tend to invalidate that subspecies. Furthermore, some narrow scales do occur on the scutellum, ante- and postpronotum of South African material so the retention of the subspecies does not seem to be advisable.

In the female this species is separable from its congeners, except possibly from *alboventralis*, by possessing at least some broad scales on the scutellum. This is the only species of the group with a horn on the arm of the gonostylus. In those females in which the pale scales of the scutum are whitish this species has a relatively ornate scutum compared to others of the group. Like the other 4 members of its group the simple hind posttarsal claws differentiate this species from members of the *dentatus* group. From *quasiunivittatus* and *aerarius* it may be separated by the less ornate scutum and the absence of a pale line on the midfemur.

**MATERIAL EXAMINED.** SOUTH AFRICA. *Natal*: Ndumu (19 ♂, 17 ♀, 20 larvae, 2 pupae, 6 rearings). *Transvaal*: Newington (1 ♂), Naboomspruit (5 ♂, 9 ♀, 5 rearings), Onderstepoort (2 ♂, 2 ♀, 1 rearing), Pienaars River (5 ♂, 5 ♀, 5 rearings). RHODESIA. Shamva (holotype ♂, BM).

**BIOLOGY.** Although rather infrequently recorded my collections show this species and *cumminsii* to be the dominant members of the *leesoni* and *dentatus* groups respectively in the warmer lowlands of southern Africa. *Ae. leesoni* is prevalent in the thornveld of the Transvaal, at, and north of, Pienaars River and at Ndumu in northern Natal. It has been collected biting man and goat.

*Aedes alboventralis* (Theobald), fig. 39

**Protomacleaya alboventralis** Theobald, 1910, *Mon. Cul.* 5: 251

**Ochlerotatus alboventralis** Edwards, 1912, *Bull. ent. Res.* 3: 21; 1917, *Ibid.* 7: 221.

**Aedes (Aedimorphus) alboventralis** Edwards, 1941, *Mos. Ethiop. Reg.*: 182; Hopkins, 1952, *Ibid.*: 184; Muspratt, 1955, *J. ent. Soc. sth. Afr.* 18: 167.

**FEMALE.** Not separable from *leesoni* on limited material available.

**MALE. Genitalia:** gonostylus without dorsal horn on arm, apical margin bearing about 6 spatulate setae and ventrally, a long pubescent flap, projecting almost at right angles to gonostylar axis (fig. 39).

**LARVA.** Probably not separable from *leesoni*. Antenna probably slightly longer than head, infusate on apical half; seta 1-A inserted at 0.54; comb of about 20 scales; pecten with 18 closely-spaced proximal spines and 2 widely-spaced distal spines, former with one basal denticle. latter similar or simple; seta 1-S very small, with 6 branches; apical margin of saddle strongly spiculate. SL 3.2. PL 0.47. HL 0.70.

**TAXONOMIC DISCUSSION.** It seems probable that the holotype from Angola, labelled cotype, is not conspecific with the current concept of *alboventralis* in which the male genitalia is at present the only reliable means of defining the species. This female (the other cotype has both hindtarsi missing) has the hind posttarsal claws armed whereas all males I have examined have these claws simple as in other species of Edwards' *abnormalis* group. Three females and 2 males from Rolle Siding, among the SAIMR collection, also have simple hindclaws, although there is apparently no record to indicate how the two sexes in these particular specimens were associated. Until

associated males and females are available, it seems advisable that a decision on this matter be postponed.

**MATERIAL EXAMINED.** ANGOLA. Bihé and Katema Bihé (holotype ♀, cotype ♀ BM). SOUTH AFRICA. *Transvaal*; Rolle Siding (2 ♂, 3 ♀), Nylstroom (2 ♂, 1 larva). RHODESIA. Shamva (6 ♂).

*Aedes eritreae* Lewis, fig. 40

**Aedes (Aedimorphus) eritreae** Lewis, 1942, *Proc. Roy. ent. Soc.* 11: 165; Muspratt, 1955, *J. ent. Soc. sth. Afr.* 18: 166.

**FEMALE.** Very similar to *leesoni*. Proboscis palish ventrally; scutal scales mainly pale with pattern of yellow scales less distinct; scutellar scales entirely narrow; apicolateral dark patches on sterna not joining mesally on distal segments. Wing 3.7 mm. Proboscis 2.0 mm.

**MALE.** Palpus longer than proboscis by about length of terminal segment, strongly setose, apex of shaft with 40 setae, segment 4 with 110. *Genitalia*: gonostylus lacking the dorsal horn on arm, distal expansion not obviously forming diverging arms; ventral margin of this expansion forming an evenly rounded prominence; apical margin not, or hardly indented, bearing about 5 setae with somewhat rounded apices; prominence on apical margin at base of terminal dorsal horn without a minute seta (fig. 40). Proboscis 2.2 mm. Palpus 2.6 mm.

**LARVA.** Antenna 0.64 as long as head, not infusate on apical 0.5; seta 1-A with 6-9 branches; 5-C with 2-3 (3) branches; 6-C double; 7-C with 5-6 branches. SL 3.7. PL 0.54. HL 0.7.

**TAXONOMIC DISCUSSION.** It seems that a male should be designated as lectotype as the species is best defined on the gonostylus. This species can be separated from *leesoni* in the female by the narrow scutellar scales and in the male by the gonostylus. The shorter and paler antenna may also separate these species in the larva. The scales of the vertex and scutum of females from Eritrea are much paler than those from South Africa, in fact, being similar to *karooensis* in this respect. A male from Sudan had 41 setae on the palpal shaft and 116 on segment 4 and is accordingly similar to *eritreae* from South Africa.

**MATERIAL EXAMINED.** ERITREA. Acchele Guzai, Debre Axum, Eritrea (syntypes 1 ♂, 1 ♀, BM). SOUTH AFRICA. *Transvaal*; Pienaars River (15 ♂, 15 ♀, 12 larvae, 2 pupae, 5 rearings).

**BIOLOGY.** Although this species has been collected at only a single locality it was quite common there from which it seems likely that it might be prevalent in the semi-arid thornveld savanna of the central and western Transvaal. It was collected off man in the early night close to a grassy pan.

*Aedes karooensis* Muspratt, **stat. nov.**, fig. 41

**Aedes (Aedimorphus) eritreae karooensis** Muspratt, 1961, *J. ent. Soc. sth. Afr.* 24: 93

**FEMALE.** Similar to *eritreae*. Decumbent scales of vertex entirely, or almost entirely, pale; erect vertical scales entirely pale; scutal scales entirely, or almost

entirely, pale; scutal scale pattern not evident; sometimes a few scales present on pre-alar knob. Wing 4.0 mm.

MALE. Palpus shorter, longer than proboscis by about 0.5 or less of terminal segment, moderately setose, shaft with 27 setae, segment 4 with 63. *Genitalia*: very similar to *eritreae*; setae on apical margin of gonostylus with rather pointed apices; prominence at base of terminal horn of gonostylus bearing a small hair-like seta (fig. 41). Proboscis 2.2 mm. Palpus 2.3 mm.

LARVA. Seta 5-C with 3-5 branches; 6-C with 3-4 branches. SL 3.8. PL 0.57. HL 0.72.

**TAXONOMIC DISCUSSION.** This species is raised to specific rank mainly because of the male palpus which is shorter and less setose than *eritreae*. The more pointed setae along the apical margin of the gonostylus are also constantly present in the limited material available, whereas in *eritreae* from South Africa, Eritrea (paratypes) and Sudan, these setae have rounded apices. While the small seta at the base of the gonostylar horn is constantly absent in *eritreae* from South Africa it is present on one of the paratypes of *eritreae* and seems therefore an unreliable differentiating character. The paler vertex and scutum as well as the presence of pre-alar scales in *karooensis* would also serve to separate, if somewhat unreliably, the females of these two species in South Africa.

**MATERIAL EXAMINED.** SOUTH AFRICA. *Cape*; Noupoort (holotype ♂, SAIMR. 4 ♂, 5 ♀), Bethesda Road Siding, Naudesberg (1 larval pelt).

**BIOLOGY.** Apparently adapted to more arid conditions than *eritreae* in South Africa.

#### *Aedes dalzieli* (Theobald), fig. 42

**Culiciomyia dalzieli** Theobald, 1910, *Mon. Cul.* 5: 234

**Aedes rhecter** Dyar, 1921, *Insec. Inseit. menst.* 9: 51

**Aedes (Aedimorphus) dalzieli**: Edwards, 1941, *Mos. Ethiop. Reg.*: 183

FEMALE. Similar to *eritreae*. Erect scales of vertex entirely dark; proboscis entirely dark; scutal scales mainly dark, with a few scattered yellow scales throughout as well as concentrations of yellow scales on anterior promontory, scutal angle, posterior fossal line; spots of very pale yellow to whitish scales on supra-alar region, mesally of this region and around bare space; scutellar scales narrow, whitish; pleural scale patches rather white, smaller, pre-alar knob without scales. Wing 3.7 mm. Proboscis 2.2 mm.

MALE. Palpus longer than proboscis by about length of terminal segment, strongly setose, shaft with 44 setae, segment 4 with 131. *Genitalia*: gonostylus with dorsal arm of terminal expansion very narrow and strongly divergent (nearly 90°) from longitudinal axis of gonostylus; setae on apical margin of gonostylus relatively long and spatulate (fig. 42).

LARVA. Antenna about 0.8 as long as head, infusate on apical 0.5; seta 1-A with 6 plumose branches, inserted at 0.5; 5, 6-C with 3 plumose branches; 7-C with 6 plumose branches. SL 4.0. PL 0.54. HL 0.71.

**TAXONOMIC DISCUSSION.** The scutal scales of *dalzieli* are darker than its congenors, with the patches of white scales on the supra-alar region and around the bare space contrasting with the dark scales. The pleural scale patches are noticeably smaller than is usual among this group, especially in specimens from Rhodesia. However, it is mainly on the basis of the gonostylus that the differentiation of this species rests. The Rhodesian material is essentially similar to that of a series bred out from eggs from Senegal sent to me by Dr Michel Cornet of ORSTOM.

**MATERIAL EXAMINED.** NIGERIA. Katagum (holotype ♀, BM). Rhodesia. Robin's Camp, Wankie Game Reserve (8 ♂, 4♀).

**BIOLOGY.** The Rhodesian material was bred out from pupae encountered in very large numbers in a recently flooded open grassy pan. Its distribution suggests that possibly it is an important *Aedimorphus* in the warmer wooded savannas of Africa.

### **Dentatus Group**

*Aedes dentatus* (Theobald), figs 43, 47, 53, 56

**Culex dentatus** Theobald, 1905, *First Rept. Wellcome Lab.* 1: 75

**Ochlerotatus dentatus:** Edwards, 1911, *Bull. ent. Res.* 2: 248; 1912; *Bull. ent. Res.* 3: 23 (synon. *pallidopunctata*); 1915, *Bull. ent. Res.* 5: 277

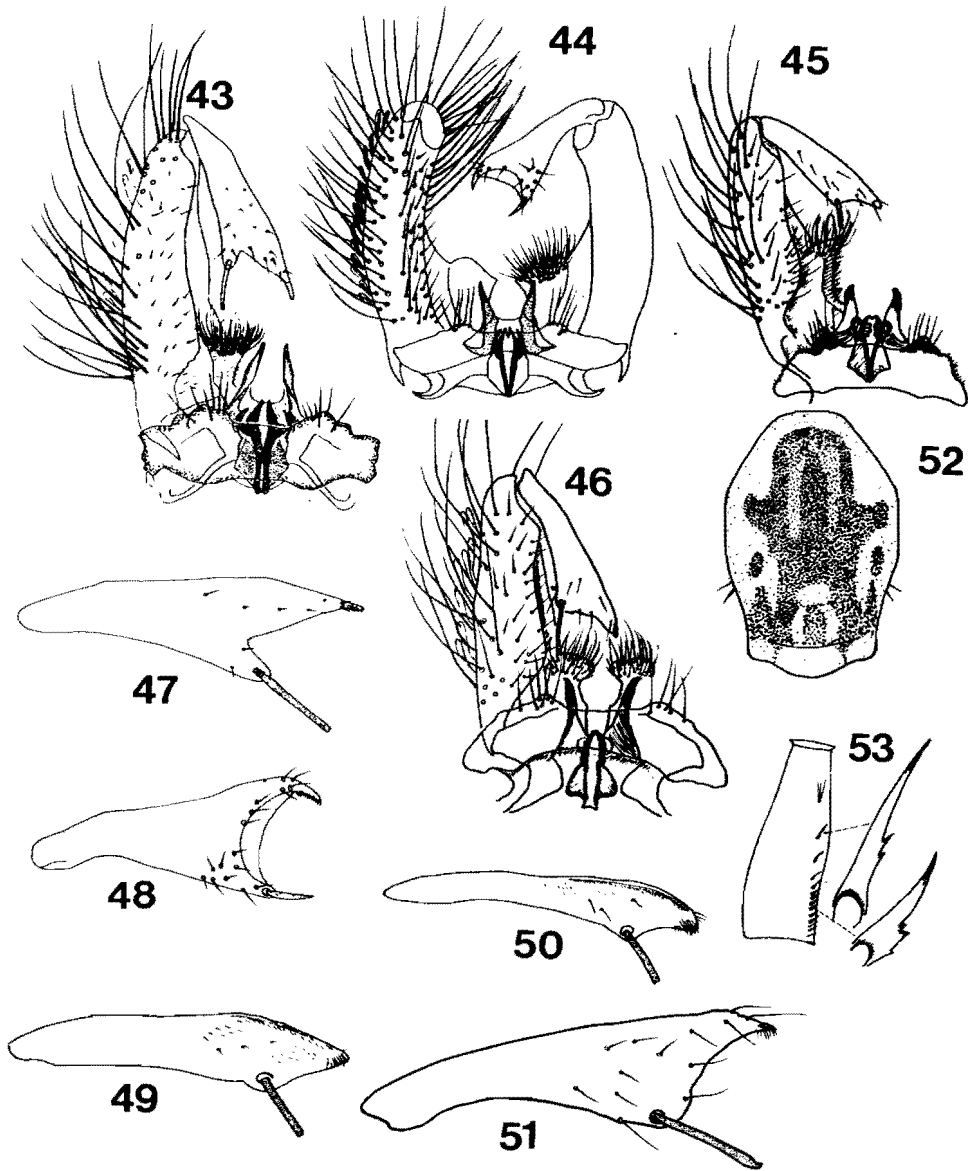
**Culex pallidopunctata** Theobald, 1911, *Union sth. Afr. Dept. Agr., First Rept. Vet. Res.* 267

**Aedes (Aedimorphus) dentatus:** Edwards, 1941 *Mos. Ethiop. Reg.*: 190; Hopkins, 1952, *ibid.*: 194; Muspratt, 1955, *J. ent. Soc. sth. Afr.* 18: 167; Ovazza et al., 1956, *Bull. Soc. Path. exot.* 49: 161

**FEMALE.** *Head:* decumbent scales of vertex narrow, bronze in front, remainder pale yellow; erect scales mainly dark; proboscis, palpus dark; torus yellow, with dark scales mesally, rarely, also with white scales. *Thorax:* scutal scales mainly dark brown with moderate sprinkling of yellow and pale yellow scales; indefinite pattern produced by concentration of yellow scales on angle, posterior fossal line, posterior fossal macula, and of pale yellow scales on supra-alar region and around bare space; sometimes a narrow line of yellow scales along posterior dorsocentrals producing a linear pattern; scutellum with pale yellow narrow scales; paratergite, anteprenotum with broadish pale yellow or creamy scales; postpronotum with narrow scales, these small dark antero-dorsally, long yellow postero-ventrally; pleural scales broad, creamy; postspiracular, subspiracular patches with 10–20 scales; sometimes a small additional subspiracular patch present; pre-alar knob bare or with 1–2 scales; upper and lower mesepisternal and upper mesepimeral scale patches large; 21–28 (usually about 23) upper mesepimeral setae present; very rarely (Salisbury) one lower mesepimeral seta present. *Abdomen:* terga with poorly-developed basal band; well separated from lateral patches, decreasing in size on successive segments; lateral patches large, extending apically to about 0.75 of segment; sterna mainly pale, with rather broad dark median bands extending to half or whole length of segment; apico-lateral dark patches sometimes present, size variable. *Legs:* femora with small knee-spot; femur I sometimes with narrow pale line on basal half of ventral margin; tibiae I, II weakly pale at apex, tibiae III apical mark larger, but still shorter than tibial diameter; posttarsal claws of all legs equal, each claw armed. *Wing:* dark. Wing 4.0–4.5 mm. Proboscis 2.6–2.8 mm.

**MALE.** *Head:* decumbent scales of vertex entirely pale; palpus longer than proboscis by 0.5–1.0 length of terminal segment, very strongly setose, shaft with 38–67





Figs 43–53. *Dentatus* group species of *Aedes*. 43. *Dentatus*, male genitalia. 44. *Pachyurus*, male genitalia. 45. *Bevisi*, male genitalia. 46. *Cumminsii*, male genitalia. 47. *Dentatus*, gonostylus. 48. *Pachyurus*, gonostylus. 49. *Bevisi*, gonostylus. 50. *Subdentatus*, gonostylus. 51. *Cumminsii*, gonostylus. 52. *Bevisi*, scutum. 53. *Dentatus*, siphon.

setae, segment 4 with 150–190. *Thorax*: scutal scales paler, sometimes almost all scales yellow; postpronotal scales yellow; postspiracular scale patch small or absent. *Abdomen*: terga with well-developed basal band; lateral patches absent. *Legs*: knee-spots and apical spots of tibiae very small; claws of posttarsi I, II unequal, each armed, of posttarsus III equal, armed; all claws inserted apically (fig. 56). *Genitalia*: gonocoxite rather narrow and curved on apical half, strongly setose on sternomesal margin; basal mesal lobe, well-developed, prominently projected mesally, apex weakly rounded, bearing numerous closely-spaced setae with bent apices (fig. 43); gonostylus slightly curved, gently expanding towards forked apex, covered with minute hairs; dorsal arm of fork pointed, bearing numerous hairs apically as well as a few larger setae subapically; ventral arm shorter, bearing one strong gonostylar claw (fig. 47); paraproct with basal tooth, cercal setae absent. Proboscis 2.5 mm. Palpus 2.6–2.7 mm.

**LARVA.** Antenna 0.5 as long as head; seta 1–A with 5–9 lightly plumose branches; 4–C small, with 5 branches, inserted level with 6–C; 5–C simple, with 2–3 branches (South Africa), 3–4 branches, (Rhodesia); 6–C simple, single; 7–C lightly plumose, with 6–10 branches; comb consisting of one or two rows of about 10 spines, weakly fringed basally; pecten consisting of 15 closely-spaced proximal spines and 2–3 larger, widely-spaced distal spines; proximal spines with 1–3 basal denticles, distal spines simple, sometimes with 1–2 small denticles; 1–S slightly distal to pecten, with 2–4 branches, about 0.3 width of siphon (fig. 53); saddle finely denticulate, denticles increasing in size towards apical margin; 1–X single, 2–X with 6 branches, 3–X single; ventral brush with about 10 setae on grid, about 3 precratal setae; anal papillae about 2.5 length of saddle. SI 3.0, SL 2.5–2.9, PL 0.52–0.67, HL 0.57–0.74.

**TAXONOMIC DISCUSSION.** Edwards (1941) was doubtful about the identity of the holotype because at that time no males were known from Ethiopia but Ovazza *et al.*, (1956) have since identified males from that country. Like other species of the *dentatus* group, *dentatus* is not easily differentiated from its congeners in the female, except little difficulty should arise in separating it from *bevisi* and *cumminsii*. The female differs from *subdentatus* by having more upper mesepimeral setae, fewer pre-alar scales and the presence of median dark scaling on the sterna. It is rather unreliably differentiated from the *pachyurus* female by having a darker and less ornate scutum. *Ae. pachyurus* is apparently restricted to the eastern seaboard of South Africa where *dentatus* is by no means common. The male genitalia clearly separates this species from all others.

**MATERIAL EXAMINED.** ETHIOPIA. (holotype ♀, BM). SOUTH AFRICA. *Transvaal*: Onderstepoort (*pallidopunctata* type ♀, BM), (1 ♂, 2 ♀), Johannesburg (4 ♂, 5 ♀), Lake Chrissie (3 ♂), Ermelo (1 ♂), Magoeba's Kloof (3 ♂). *Natal*: Mont-aux-Sources (1 ♂, 1 ♀), Mtunzini (1 ♂), Oslo Beach (5 ♂, 6 ♀, 7 larvae, 3 pupae, 4 rearings). *Cape*: Grahamstown (2 ♂, 2 ♀, 1 rearing). Kokstad (8 ♂, 8 ♀, 15 larvae, 3 pupae, 4 rearings), Worcester (1 ♂). *Orange Free State*: Harrismith (1 ♂). RHODESIA. Salisbury (14 ♂, 11 ♀, 8 larvae, 2 rearings).

**BIOLOGY.** Predominantly a highland species, particularly where rainfall is high. It is one of the three dominant *Aedes* species in the moist, Transvaal highveld where it feeds readily on man and the larger domestic mammals. In this region *dentatus* has been tested for virus in fair numbers without positive results although a strain of

Rift Valley fever virus was isolated from *dentatus* on the Rhodesian highlands during an epizootic among cattle (McIntosh, 1972).

*Aedes subdentatus* Edwards, fig. 50

**Aedes (Aedimorphus) subdentatus** Edwards, 1936, *Proc. Roy. ent. Soc. Lond. (B)* **5**: 51; 1941, *Mos. Ethiop. Reg.*: 191; Muspratt, 1955, *J. ent. Soc. sth. Afr.* **18**: 168 (synon. of *bevisi*?)

**FEMALE.** Similar to *dentatus*. Smaller; decumbent scales of vertex creamy, broadish laterally; proboscis rarely palish below; palpus sometimes with few pale scales ventrally and apically; scutal scales mainly pale, sometimes with indistinct pattern; 10–15 pre-alar scales usually present; upper mesepimeron with 12–15 setae; sterna without median dark bands; sometimes tarsomeres 2, 3 with vague paleness at the joints, especially posteriorly. Wing 3.3–3.8 mm. Proboscis 2.2–2.4 mm.

**MALE.** Palpus barely longer than proboscis, moderately setose, shaft with 33 setae, segment 4 with 76; gonocoxite with fewer setae on sternomesal margin; basal mesal lobe jutting out mesally even more prominently and bearing more apical setae; gonostylus not forked at apex, with claw inserted at widest part and divergent from longitudinal axis of gonostylus (fig. 50); base of paraproct with triangular tooth projecting mesally. Proboscis 2.1 mm. Palpus 2.1 mm.

**LARVA.** Similar to *dentatus*. Seta 5–C with 2–4 branches, usually 3; seta 6–C single rarely with 2 branches. SL 2.8–3.5. PL 0.63–0.67. HL 0.70–0.76.

**TAXONOMIC DISCUSSION.** Muspratt (1953, 1955) seemed inclined to regard *subdentatus* as a synonym of *bevisi*, although he had no reliable material of *subdentatus* for comparison. From material available to me these species are separable in both sexes. In the male, the palpus of *bevisi* is more setose, and in the female the proboscis, scutal and pre-alar scales and tarsal banding all show differences. Females of *subdentatus* are difficult to separate from those of *dentatus* and *pachyurus* although size, scutal and pre-alar scales, upper mesepimeral setae and sterna all show slight differences which would enable separation in some specimens. At present *subdentatus* seems doubtfully differentiated from *calignosus* (Graham) 1910, although my examination of the genitalia of the holotype male of *calignosus* indicated that Edwards was correct in separating them.

**MATERIAL EXAMINED.** SOUTH AFRICA. *Cape*; Grahamstown (holotype ♂, BM), Graaff-Reinet (10 ♂, 18 ♀, 11 larvae, 2 pupae, 1 rearing). *Natal*; Oslo Beach (11 ♂, 10 ♀, 4 larvae, 1 rearing), Port Shepstone (12 ♂, 10 ♀), Josini (2 ♂). *Transvaal*; Newington (1 ♂, 3 ♀).

**BIOLOGY.** The material from Port Shepstone was bred out from larvae and pupae collected in a temporary, sunny ground pool amongst short grass.

*Aedes pachyurus* Edwards, figs 44, 48, 54, 55

**Aedes (Aedimorphus) pachyurus** Edwards, 1936, *Proc. Roy. ent. Soc.* **5**: 51; Edwards, 1941, *Mos. Ethiop. Reg.*: 191; Muspratt, 1953, *J. ent. Soc. sth. Afr.* **16**: 87

**FEMALE.** Very similar to *dentatus*. Usually slightly smaller; scutum with more pale scales, and these scales producing a more evident pattern, particularly on anterior

0.5 where prominent yellow patches evident on anterior promontory and prescutal macula; upper mesepimeral setae slightly fewer, 17–20 setae. Wing 4.1 mm. Proboscis 2.5 mm.

**MALE.** Palpus about as long or shorter than proboscis; terminal segment 0.68 as long as penultimate, very lightly setose, shaft with 8 setae, segment 4 with 33, both groups of setae shorter than usual; tergum VII widened apically with apical margin unusually emarginate; abdominal segment VIII of unusual shape on lateral view, sternum dome-like, tergum very hairy (fig. 54); post-tarsus I with claw inserted subapically (fig. 55). *Genitalia*: gonocoxite broader, densely setose on sternomesal margin, particularly on apical 0.5; apical dome of basal mesal lobe sloping inwards, setae thicker and barely bent at apex (fig. 44); gonostylus broader apically, both arms equally projected, apical margin evenly rounded instead of V-shaped (fig. 48). Proboscis 2.3 mm. Palpus 2.2 mm. Segment 4 0.38 mm. Segment 5 0.26 mm.

**LARVA.** Very similar to *dentatus*. Seta 5–C single, rarely bifid; 6–C single. SL 2.5–2.9. PL 0.53–0.61. HL 0.63–0.73.

**TAXONOMIC DISCUSSION.** On palpal, genitalic, posttarsal and abdominal characters this is a clearly-defined species in the male, the latter two features being, as far as I know, unique in the subgenus. In the female difficulty would be encountered in separating it from *dentatus* and *subdentatus*.

**MATERIAL EXAMINED.** SOUTH AFRICA. *Cape*: Kaaiman's Gat (holotype ♂, BM), Plettenberg Bay (6 ♂, 10 ♀, 6 larvae, 3 pupae, 1 rearing). *Natal*: Oslo Beach (12 ♂, 13 ♀, 14 larvae, 2 pupae, 4 rearings).

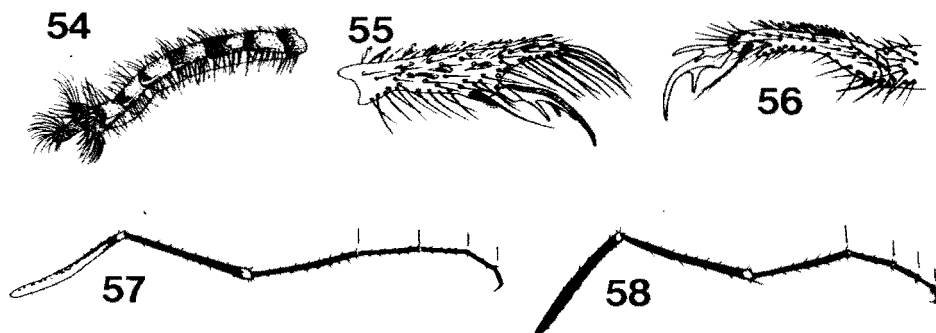
**BIOLOGY.** I collected adults close to estuaries and Muspratt (1953) collected larvae from a shaded pool at the edge of a coastal river. It has been collected off human and goat baits.

*Aedes bevisi* (Edwards), figs 45, 49, 52, 57, 58

*Ochlerotatus bevisi* Edwards, 1915; *Bull. ent. Res.* 5: 275

*Aedes (Aedimorphus) bevisi*: Edwards, 1941, *Mos. Ethiop. Reg.*: 194; Muspratt, 1950, *J. ent. Soc. sth. Afr.* 13: 77; Muspratt, 1953, *Ibid.* 14: 88; Muspratt, 1955, *Ibid.*: 168

**FEMALE.** Much paler than its congeners. *Head*: erect scales of vertex entirely, or almost entirely, pale; proboscis creamy below except for apical and basal 0.1; creamy at sides on middle half, sometimes also pale above on middle 0.3; palpus with a few pale scales apically; pedicel, basal flagellomere with pale scales mesally. *Thorax*: scutum frequently with striking pattern of pale yellow and bronze scales (fig. 52); postpronotum entirely with pale scales; pre-alar scales usually few, 5 or less; 18–20 upper mesepimeral setae present; rarely (one specimen) with 2–3 lower mesepimeral setae. *Abdomen*: terga with poorly-developed basal bands, well separated from large lateral patches; sterna mainly creamy with dark apico-lateral patches. *Legs*: extensively creamy posteriorly; femur III extensively creamy anteriorly; knee-spots and tibial apical spots paler than usual; tibiae II usually pale along entire dorsal margin; tarsomeres 2, 3 of all legs narrowly pale basally (figs 57, 58). Wing 4.0 mm. Proboscis 2.4 mm.



Figs 54-58. *Dentatus* group species of *Aedes*. 54. *Pachyurus*, lateral view of male abdomen. 55. *Pachyurus*, claws posttarsus I. 56. *Dentatus*, claws, posttarsus I. 57. *Bevisi*, hindleg. 58. *Bevisi*, midleg.

**MALE.** Decumbent scales of vertex mainly broad; palpus longer than proboscis by about half of terminal segment, heavily setose, shaft with 104 setae, segment 4 with 288; apical 0.2 of shaft and whole of segment 4 broader than usual; proboscis entirely dark, or indistinctly pale below on middle 0.3; postspiracular, pre-alar scales fewer, frequently absent; terga with broad basal bands; tarsal bands indistinct or absent; genitalia similar to *subdentatus*; gonostylus perhaps slightly thicker (figs 45, 49). Proboscis 2.38 mm. Palpus 2.56 mm.

**LARVA.** Similar to *dentatus*. Seta 5-C single, rarely bifid; 6-C bifid. SL 2.7-2.9. PL 0.56-0.60. HL 0.70-0.83.

**TAXONOMIC DISCUSSION.** The most distinctive species of the *dentatus* group in the female in which the general impression is of a predominantly pale yellow mosquito although it seems likely that the tarsal bands would at times be indistinct or absent. Although in the male the genitalia are indistinguishable from those of *subdentatus* the two species are clearly separable by the length and setosity of the palpus.

**MATERIAL EXAMINED.** SOUTH AFRICA. *Natal*; Umbilo (holotype ♀, BM, 2 ♀), Oslo Beach (13 ♂, 26 ♀, 9 larvae, 2 pupae, 9 rearings), Isipingo (1 ♀), Ntambana (1 ♀), Umthlatuzi (1 ♀), Mtunzini (1 ♂), Gwalaweni (9 ♀), Josini (3 ♀). *Cape*; Bedford (1 ♂).

**BIOLOGY.** Muspratt (1955) collected females biting in several localities, usually in coastal or montane forest. A strain of Bunyamwera virus has been isolated from females collected at Oslo Beach.

*Aedes cumminsii* (Theobald), figs 46, 51

*Culex cumminsii* Theobald, 1903, *Mon. Cul.* 3: 214

*Culicada mediopunctata* Theobald, 1910, *Mon. Cul.* 5: 304

*Culicada fuscopalpalis* Theobald, 1910, *Mon. Cul.* 5: 307

*Ochlerotatus cumminsii*: Edwards, 1911, *Bull. ent. Res.* 2: 248

*Aedes (Aedimorphus) cumminsi* var. *mediopunctata*: Edwards, 1925, *Bull. ent. Res.* 15: 264; Haddow, Someren, Lumsden, Harper & Gillett, 1951, *Bull. ent. Res.* 42: 224 (syn.)

**Aedes (Aedimorphus) cumminsi mediopunctatus:** Edwards, 1941, *Mos. Ethiop. Reg.*: 193; Muspratt, 1956, *J. ent. Soc. sth. Afr.* 19: 42

**Aedes (Aedimorphus) cumminsi:** Edwards, 1941, *Mos. Ethiop. Reg.*: 193 (in part); Hopkins, 1952, *Ibid.*: 195

**FEMALE.** Like *dentatus*. Larger; decumbent scales of vertex entirely pale; erect scales sometimes entirely pale; scutal scales almost entirely pale yellow, although usually also with concentrations of bronze scales on scutal fossa and a narrow line along posterior dorsocentrals; paratergite with broad, creamy scales; postspiracular scales sometimes rather fewer; terga with small mediobasal spots, usually longer than broad, especially on distal segments; sterna creamy with apicolateral dark patches tending to join mesally. Wing 4.8–5.0 mm. Proboscis 2.7–2.9 mm.

**MALE.** Palpus longer than proboscis by length of terminal segment and about 0.25 of segment 4, strongly setose, shaft with 112 setae, segment 4 with 220; terga with long, narrow basal spots as in female; genitalia very similar to *subdentatus* and *bevisi* (fig. 46); gonocoxite rather more heavily setose on sternomesal margin; basal mesal lobe slightly smaller, projecting less prominently mesally; gonostylus of slightly different shape, being larger and slightly wider apically (fig. 51). Proboscis 2.8 mm. Palpus 3.8 mm.

**LARVA.** Antenna rather short, only about 0.3 length of head; seta 1–A inserted at 0.3 with 8 short and thick branches; integument of head covered with spicules; 5, 6–C usually single, strong, simple; 7–C with 6 short, thick branches; skin of thorax and abdominal segments with numerous small, chitinous plates, bell-shaped on thorax, elliptical on abdomen, and all setae unusually strong, short; comb with 8–12 spines; pecten consisting of 10–14 closely-spaced spines with several basal denticles and about 3 widely-spaced distal spines, some simple, the most distal inserted subapically beyond seta 1–S; seta 1–S with about 3 branches, only about 0.25 as long as siphon diameter; saddle strongly spiculate on apical margin; ventral brush with short setae, 6–9 precratal setae, 10 setae on grid. SL 2.9–3.7. PL 0.77–0.93. HL 0.60–0.63.

**TAXONOMIC DISCUSSION.** Edwards (1941) described the type form of *cumminsi* from the Sudan as being without basal marks on the terga and considered *holocinctus* with moderate broad bands, and *mediopunctatus* with long narrow spots, both as subspecies. Ovazza *et al.* (1956) raised *holocinctus* to specific status and because *mediopunctatus* co-existed with the type form in Uganda, Haddow *et al.* (1951) suggested *mediopunctatus* as a synonym of *cumminsi*. The holotype has, in fact, a few pale scales basomesally on terga II, III. In southern Africa apparently only *mediopunctatus* occurs. It does not seem possible to resolve the status of the latter until more topotypical material becomes available.

Although the larva of *cumminsi* has some distinguishing and unique features the adults are rather similar to species of the *dentatus* group and on male genitalia alone clearly belongs in this group. However, its large size, narrow basomedian tergal spots and the almost entirely pale scutal scales easily identify this species in both sexes in southern Africa.

**MATERIAL EXAMINED.** SUDAN. Bahr-el-Ghazel (holotype ♀, BM). SOUTH AFRICA. Natal; Ndumu (9 ♂, 28 ♀, 6 larvae, 2 pupae, 3 rearings). Transvaal; Naboomspruit (6 ♂, 6 ♀, 6 larvae, 2 pupae). RHODESIA. Chipinda Pools (2 ♀).

**BIOLOGY.** In association with the riverine pans of the Pongola and Usutu

Rivers at Ndumu this species was second in prevalence among *Aedimorphus* species during a long-term arbovirus study. At this locality, where it was shown to feed on man at ground level in bush (McIntosh *et al.* 1972a), Spondweni, Sindbis, Middelburg and Shokwe viruses have been isolated from it (McIntosh, Kokernot *et al.* 1961, McIntosh *et al.* 1972b).

### ***Aerarius* Group**

***Aedes aerarius* spec. nov., figs 59, 60, 62, 63, 64, 66, 68**

**FEMALE.** *Head:* decumbent scales narrow, pale yellow on occiput, laterally, along orbital margin and frontal tuft, with a brown patch mesally; erect scales mainly dark with scattered pale scales; proboscis, palpus dark; torus with pale scales mesally. *Thorax:* scutum with conspicuous pattern of pale yellow and golden scales on background of dark brown scales (fig. 59); these pale scales as follows: (1) broad median band on anterior 0.5 of scutum, (2) narrow peripheral band along anterior promontory extending to scutal angle but tending to be broken between prescutal margin and angle, (3) supra-alar region, (4) narrow band along posterior dorsocentrals, (5) patches in front and at side of prescutal bare space; scutellar scales narrow, pale yellow; anteprenotum with narrow pale yellow scales; scales on postpronotum dark anteriorly, pale yellow broadish posteriorly; paratergal scales creamy and broad; pleural scales broad, creamy to white; large patches on postspiracular and subspiracular areas, the latter with small additional patch; a few pre-alar scales usually present; mesepisternal and upper mesepimeral patches very large. *Abdomen:* terga with narrow basal creamy bands separated from lateral patches, sometimes absent on terga VI, VII; large rectangular lateral patches extending caudally to about 0.5 length of segment; sterna I–VI largely pale, scattered dark scales mesally, tending to form median bands on V, VI; sterna VII mainly dark. *Legs:* femora with small knee-spots, extensively pale posteriorly; femur I with pale broken line usually along entire length of ventral margin (fig. 62); femur II with narrow, median line of scattered pale scales extending almost entire length of femur (fig. 63); femur III pale on basal 0.75–0.9 except for dark dorsal line not quite reaching base (fig. 60); tibiae with pale apical spot, that on tibia III as long as broad; tibia II with pale narrow line posteriorly usually along entire length; claws on posttarsi I, II armed; on III simple. *Wing:* dark. Wing 4.3 mm.

**MALE.** Palpus as long as or slightly shorter than proboscis, almost devoid of setae, shaft with 3 setae, segment 4 with 16; scutal pattern not so evident; pale lines on femora I, II much reduced, sometimes absent. *Genitalia:* basal mesal lobe prominent, rectangular in outline, with apex reaching to 0.75 length of gonocoxite, densely covered on apical 0.5 with short, strong, pointed setae (fig. 64); gonostylus forked apically with dorsal arm longer and stouter than ventral, bluntly pointed and bearing a few subapical setae; ventral arm with a flat apical seta (fig. 66); paraproct with enlarged base and finger-like projection reaching almost to half length of gonocoxite, toothed apex, without setae; lateral plates of phallosome rather far apart; tergum IX with rather straight apical margin. Proboscis 2.15 mm. Palpus 1.9 mm.

**LARVA.** Seta 1–A with 5–11 plumose branches; 4–C placed level with 6–C; 5–C with 6–8 branches; 6–C with 3–4 branches; 7–C with 11 branches; comb with 10–11 spines; pecten with 12–13 spines, distal spines simple, well apart, proximal spines with 1–3 basal denticles (fig. 68); 1–S with 4–5 branches; 1–X single; 2–X single; 3–X

with 9 branches; ventral brush with 12 setae containing 12–14 branches. SI 2,8. SL 3,1–3,5. PL 0,53. HL 0,70.

**TAXONOMIC DISCUSSION.** This species is closest to *gibbinsi* Edwards, 1935, from which it differs by the presence of the pale median line on the midfemur, scutal pattern and the presence of tergal bands instead of basomesal spots as in *gibbinsi*. In the latter the scutal pattern has a continuous lateral border which bends inwards along the posterior fossal line to join the posterior dorsocentral line. In *aerarius* the lateral pale scaling is broken and narrower. From *quasiunivittatus* it can be separated by the highly setose male palpus and in the female, perhaps rather unreliably, by the more conspicuous scutal pattern and the absence of the pointed median pale scaling on the apical half of the hindfemur.

**MATERIAL EXAMINED.** SOUTH AFRICA. Natal; Oslo Beach (holotype ♀, allotype ♂; 17 ♂, 18 ♀, 19 larvae, 2 pupae, 3 rearings). Holotype, ♀, reared in isolation from female M1152C collected by me at Oslo Beach, Natal, SOUTH AFRICA, in April, 1972. Allotype, ♂, reared from same female as holotype; 8 ♂ paratypes and 11 ♀ paratypes reared from ♀♀ M1149C, M1152A and M1152C. All the foregoing specimens carry the number of their respective dams and the accession number 7233. The holotype, allotype and 13 paratypes deposited at SAIMR; two paratypes each will be deposited at the BM, USNM and ORSTOM, respectively.

**BIOLOGY.** Adults were collected on the edges of estuaries and it seems likely that the larval habitats would be temporary ground-pools on the edges of these estuaries. It has been collected biting man and has entered goat-baited net-traps.

*Aedes quasiunivittatus* (Theobald), figs 61, 65, 67

**Culex quasiunivittatus** Theobald, 1901, *Mon. Cul.* 2: 32

**Ochlerotatus quasiunivittatus** Edwards, 1911 *Bull. ent. Res.* 2: 250; 1915, *Bull. ent. Res.* 5: 276

**Aedes (Aedimorphus) quasiunivittatus** Edwards, 1941, *Mos. Ethiop. Reg.*: 189; Hopkins 1952, *Ibid.*: 193; Muspratt, *J. ent. Soc. sth. Afr.* 18: 167; Pao & Knight, 1970, *Mosq. Syst. News Letter* 2: 117

**FEMALE.** Like *aerarius*. Decumbent scales of vertex mainly pale yellow with a few dark scales in front; erect scales dark; scutal pattern not so conspicuous mainly because background scales a lighter brown; pale patch on scutal angle joined along posterior fossal line by broad band of pale scales to posterior dorsocentral line; femur III with pale scaling on apical 0,5 as narrow median line (fig. 61).

**MALE.** Palpus about as long as proboscis, moderately setose, shaft with 27 setae, segment 4 with 68; genitalia indistinguishable from *aerarius* (figs 65, 67). Proboscis 2,6 mm. Palpus 2,6 mm.

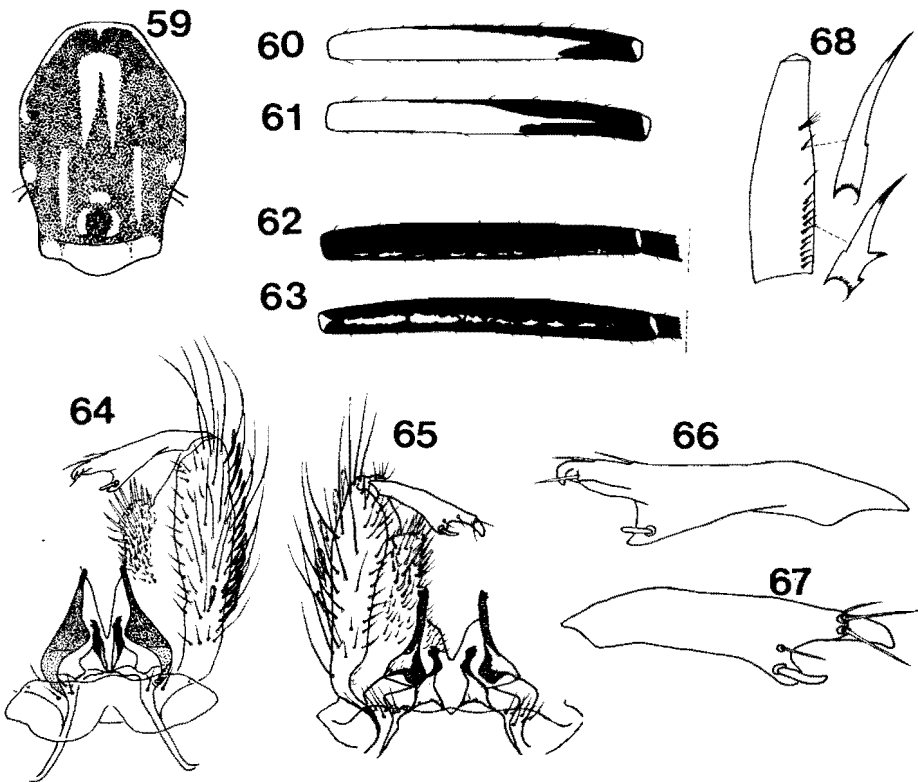
**LARVA.** Antenna spiculate; seta 1–A with 9 plumose branches, inserted at 0,4; setae 5, 6, 7–C with 7, 3, 10 plumose branches respectively; comb with 9 spines; pectin with 14 spines, distal 2 spines long, simple, remainder with 1–4 basal denticles; seta 1–S with 3 simple branches, about half as long siphon diameter; seta 2–X with 6 branches; seta 3–X single; ventral brush with 12 setae having 8–12 branches.

**TAXONOMIC DISCUSSION.** At present included under *quasiunivittatus* is a form present in Kenya, Zaïre and possibly also South Africa which may be a distinct species. It differs from *quasiunivittatus* in lacking the longitudinal white line on the



midfemur and in a palpus about twice as setose, i.e., the shaft with 52 setae and segment 4 with 128. But until more material of both type and variant becomes available, I am regarding them as conspecific. Specimens of the typical form were also seen from Malawi, Sudan, Ethiopia and Tanzania. The above description of the larva is of one pelt from Kenya and is probably the variant form.

The white line on the midfemur which has never been described before probably because of confusion with the variant form, readily identifies this species except from *aerarius*. In the female *quasiunivittatus* is not easily separated from *aerarius* and in the limited material available it seems that only the nature of the pale scaling on the apical half of the hindfemur would be reliable. At present separation of these species is largely because of differences in the setosity of the male palpus.



Figs 59-68. *Aerarius* group species of *Aedes*. 59. *Aerarius*, scutum. 60. *Aerarius*, hindfemur. 61. *Quasiunivittatus*, hindfemur. 62. *Aerarius*, forefemur. 63. *Aerarius*, midfemur. 64. *Aerarius*, male genitalia. 65. *Quasiunivittatus*, male genitalia. 66. *Aerarius*, gonostylus. 67. *Quasiunivittatus*, gonostylus. 68. *Aerarius*, siphon.

MATERIAL EXAMINED. SOUTH AFRICA. *Transvaal*: Kroondal (4 ♀), Newington (3 ♂), Pretoria (1 ♂). RHODESIA, Salisbury (holotype ♀, BM, 1 ♂).

BIOLOGY. The occurrence of this species in habitats of widely divergent ecology is also suggestive that more than one species is included in this taxon.

### *Ochraceus* Group

*Aedes ochraceus* (Theobald), figs 69–73

**Culex ochraceus** Theobald, 1901, *Mon. Cul.* 2: 103

**Mimetculex kingii** Theobald, 1908, *Rept. Wellcome trop. Res. Lab.* 3: 258

**Ochlerotatus ochraceus** Edwards, 1911, *Bull. ent. Res.* 2: 250

**Aedes (Aedimorphus) ochraceus** Edwards, 1941, *Mos. Ethiop. Reg.* 200; Hopkins, 1952, *Ibid.* 206; Muspratt, 1955, *J. ent. Soc. sth. Afr.* 18: 173; Pao & Knight, 1970, *Mosq. Syst. News Letter* 2: 114

FEMALE. *Head*: decumbent scales of vertex narrow, yellow; erect scales dark; proboscis creamy, except dark at apex and base; palpus with palish scales on middle third, about 0.2 as long as proboscis. *Thorax*: scutum with linear pattern of alternating yellow and brown scales, comprising 5 lines of yellow and 4 of brown scales, the median and lateral lines being yellow (fig. 71); scutellum with narrow yellow scales; paratergal, postspiracular scales similar, latter unusually numerous; subspiracular, pre-alar (rather numerous), mesepisternal, mesepimeral scales creamy, some unusually narrowish. *Abdomen*: terga creamy, with sublateral line of dark scales forming band along length of abdomen, but broken at base of proximal segments; sterna creamy, sometimes with narrow sublateral dark line. *Legs*: mainly creamy; femora, tibiae with median creamy line from base to apex bordered by lines of dark scales along both margins, except dorsal dark line absent on tibia II (figs 72, 73); tarsomeres 4, 5 of all legs usually dark; claws of posttarsi I, II, III equal, armed. *Wing*: with creamy scales as follows: squame scales of entire costa as well as fringe as far as apex of wing, subcosta, stem of radius; plume scales of  $R_1$ ,  $R_2 + 3$ ,  $R_2$ ,  $R_3$ , stem of median vein,  $M_1 + 2$ , basal 0.5 of  $M_1$ . Wing 4.6 mm. Proboscis 2.8 mm.

MALE. Palpus longer than proboscis by length of terminal segment, strongly setose, shaft with 66 setae, segment 4 with 177; palpal shaft yellow, segment 4 with broad white scales dorsally, also a few ventrally, segment 5 with scattered white scales; scutal scales mainly pale, pattern not evident; claws of posttarsus I unequal, only longer armed, of posttarsus II unequal, both armed, of posttarsus III unequal, both simple. *Genitalia*: basal mesal lobe poorly developed, consisting merely of a few setae at base of gonocoxite (fig. 69); gonostylus with apex enlarged, apical margin rounded, a broad, blunt-tipped horn and clump of longish setae dorsally, subapically on ventral margin a pigmented claw (fig. 70); paraproct with unusually complex apex. Proboscis 2.6 mm. Palpus 3.1 mm.

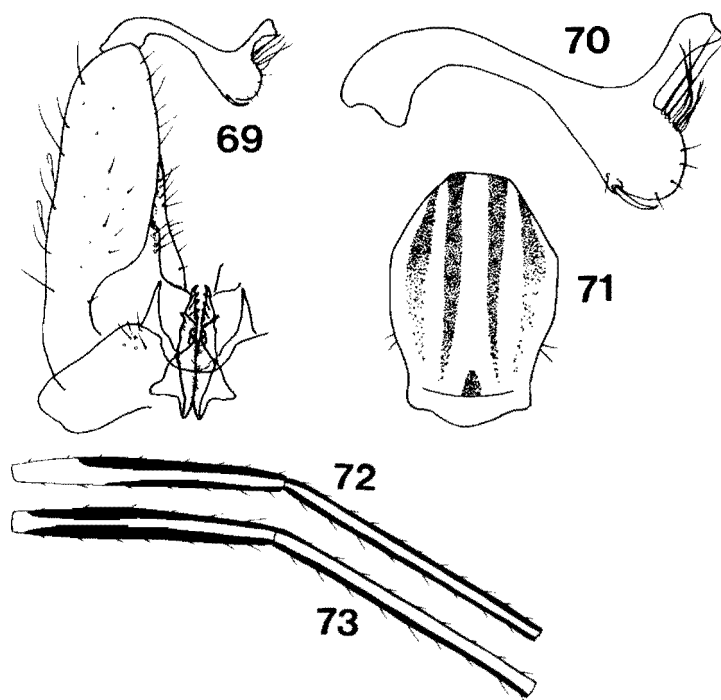
LARVA. Antenna spiculate, infusate on apical 0.5 or more, about 0.75 as long as head; setae 2, 3–A long, of equal length; seta 4–C inserted caudally of 5–C; 5–C with 5–6 branches, 6–C with 5–7, 7–C with 6–10, all these setae weakly plumose; comb with 8–13 spines; siphon with index of about 6.5, slightly curved ventrally; pecten with 9–13 denticulate closely-spaced proximal spines and 2–3 widely-spaced, usually simple, distal spines; seta 1–S inserted far distally of pecten, with about 6 weak branches, 0.3 as long

as siphon width; saddle incomplete, spiculate on apical margin; seta 1-X with 1-2 branches. 2-X with 10 branches. 3-X single; ventral brush with 5 precratal setae, and 6-8 on grid, all with 8-10 branches. SL 6.0-7.0. PL 0.42-0.46. HL 0.68-0.73.

**TAXONOMIC DISCUSSION.** This is a large, yellow and very distinctive species without any close relatives but probably closest to the *leesoni* group. The scalation of the femora, tibiae, scutum, abdomen and wing readily identify this species in both sexes. The long larval siphon is suggestive of *Culex* rather than *Aedes* species. In my experience it is unique for the sexes to differ in the arming of the claws of the hind posttarsus.

**MATERIAL EXAMINED.** SOUTH AFRICA. *Transvaal*; Newington (3 ♂, 8 ♀), Naboomspruit (7 ♂, 12 ♀, 12 larvae, 1 pupa, 2 rearings). RHODESIA. Salisbury (holotype ♀, BM), Chipinda Pools (1 ♀), Hartley (1 ♀). MOZAMBIQUE. Near Lourenço Marques (1 ♂).

**BIOLOGY.** In southern Africa this is apparently a species of the wooded, warmer savannas where experience has indicated that it is never prevalent. It has been collected in goat-baited net-traps.



Figs 69-73. *Aedes ochraceus*. 69. Male genitalia. 70. Gonostylus. 71. Scutum. 72. Hindfemur, tibia. 73. Midfemur, tibia.

## ACKNOWLEDGEMENTS

I wish to express my thanks to Dr P. F. Mattingly, British Museum (Natural History) and Dr J. Mouchet, Office de la Recherche Scientifique et Technique Outre-Mer, Bondy, France, for permission to study specimens in their respective collections. I am very much indebted to Dr Dora Anderson for the rearing of mosquitoes and to Mrs E. Nesbitt for making some of the drawings. The work was financed jointly by the South African Institute for Medical Research, the Poliomyelitis Research Foundation and the State Health Department.

## REFERENCES

- EDWARDS, F. W. 1932. *Genera Insectorum Diptera Fam. Culicidae* P. Wytsman. Brussels, Verteneuil.
- 1941. *Mosquitoes of the Ethiopian Region. III.—Culicine Adults and Pupae*. The British Museum (Natural History), Oxford University Press.
- HAMON, J., SERVICE, M. W., ADAM, J. P. & TAUFFLIEB, R. 1961. Observations sur les *Aedes (Aedimorphus)* du groupe *tarsalis* Newstead avec description d'une nouvelle espece: *Aedes grenieri* n. sp. *Bull. Soc. Path. exot.* **54**: 375-388.
- HOPKINS, G. H. E. 1952. *Mosquitoes of the Ethiopian Region. I.—Larval Bionomics of Mosquitoes and Taxonomy of Culicine Larvae*. 2nd Edition. The British Museum (Natural History).
- KNIGHT, K. L. & LAFFOON, J. L. 1970. A mosquito taxonomic glossary. III. Adult thorax. *Mosq. Syst. News Letter.* **2**: 132-146.
- LEWIS, D. J. 1944. A new subspecies of *Aedes lesoni* Edwards (Dipt., Culicidae) from the Sudan. *Proc. roy. ent. Soc. London (B)* **13**: 27-29.
- McINTOSH, B. M., WORTH, C. B. & KOKERNOT, R. H. 1961. Isolation of Semliki Forest virus from *Aedes (Aedimorphus) argenteopunctatus* (Theobald) collected in Portuguese East Africa. *Trans. roy. Soc. trop. Med. Hyg.* **55**: 192-198.
- KOKERNOT, R. H., PATERSON, H. E. & DE MEILLON, B. 1961. Isolation of Spondweni virus from four species of Culicine mosquitoes and a report of two laboratory infections with the virus. *S. Afr. Med. J.* **35**: 647-650.
- 1972. Rift Valley fever. I. Vector studies in the field. *J. sth. Afr. vet. Ass.* **43**: 391-395.
- JUPP, P. G. & DE SOUSA, J. 1972a. Mosquitoes feeding at two horizontal levels in gallery forest in Natal, South Africa, with reference to possible vectors of chikungunya virus. *J. ent. Soc. sth. Afr.* **35**: 81-90.
- JUPP, P. G. & DE SOUSA, J. 1972b. Further isolations of arboviruses from mosquitoes collected in Tongaland, South Africa, 1960-1968. *J. med. Ent.* **9**: 155-159.
- MUSPRATT, J. 1953. Research on South African Culicini (Diptera: Culicidae). II. Taxonomy relating to eight species of *Aedes*. *J. ent. Soc. sth. Afr.* **16**: 84-93.
- 1955. Research on South African Culicini (Diptera: Culicidae). III.—A check-list of the species and their distribution, with notes on taxonomy, bionomics and identification. *J. ent. Soc. sth. Afr.* **18**: 149-207.
- 1961. Research on South African Culicini (Diptera: Culicidae). VI. Two new subspecies and notes on bionomics and distribution. *J. ent. Soc. sth. Afr.* **24**: 92-103.
- OVAZZA, M., HAMON, J. & NERI, P. 1956. Contribution a l'etude des Dipteres vulnerants de l'Empire d'Ethiopie. I. *Culicide*. *Bull. Soc. Path. exot.* **49**: 151-182.
- PAO, B. & KNIGHT, K. L. 1970. The fourth instar larval mandible and maxilla of selected *Aedes (Aedimorphus)* species (Diptera: Culicidae). *Mosq. Syst. News Letter.* **2**: 98-131.
- REINERT, J. F. 1973. Contributions to the Mosquito Fauna of Southeast Asia. XVI. Genus *Aedes* Meigen, Subgenus *Aedimorphus* Theobald in Southeast Asia. *Contr. Amer. ent. Inst.* **9**: 1-218.
- SCHICK, R. X. 1970. Mosquito Studies (Diptera: Culicidae). XX. The Terrens Group of *Aedes* (Finlay). *Contr. Amer. ent. Inst.* **5**: 1-158.

- STONE, A., KNIGHT, K. L. & STARKE, H. 1959. *A synoptic catalog of the Mosquitoes of the World*. The Thomas Say Foundation, Ent. Soc. America.
- WORTH, C. B. & DE MEILLON, B. 1960. Culicine mosquitoes (Diptera: Culicidae) recorded from the province of Moçambique (Portuguese East Africa) and their relationship to arthropodborne viruses. *Anais Inst. Med. Trop.* **17**: 231-256.
- PATERSON, H. E. & DE MEILLON, B. 1961. The incidence of arthropod-borne viruses in a population of culicine mosquitoes in Tongaland, Union of South Africa. *Amer. J. trop. Med. Hyg.* **10**: 583-592.

Manuscript received 24 January 1975.